

The Victorian Naturalist

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Western District Excursion (10 days), Reports, General, Physiographical, Geological, Botanical and Entomological; and descriptions of four new species, after p. 172.	

LECTURETTES

April 16th, 1928—On Scientific Study	DR. T. D. A. COCKERELL, Univ., Colorado, U.S.A.
May 14th—Western District Excursion, Mr. E. E. PESCOTT, F.L.S.	
June 11th—Conversazione.	
July 9th—The Great Barrier Reef	DR. SYDNEY PERN
Aug. 13th—Native Bees	MR. TARBTON RAYMENT
Sept. 10th—Aboriginal Stone Axes	MR. C. DALEY, B.A., F.L.S.
Oct. 8th—Animals and Plants of the Daintree River District, Q., Mr. C. BARRETT, C.M.Z.S.	
Nov. 12th—Natural History of West Australia	MR. J. CLARK, F.L.S.
Dec. 10th—Australian Trap-door Spiders	DR. R. H. PULLEINE
Jan. 14th, 1929—Natural History of the Federal Capital Territory, Mr. C. DALEY, B.A., F.L.S.	
Feb. 11th—Beetle Pests of the Sugar Cane	MR. A. N. BURNS
Mar. 11th—Swans, Ducks and Geese	DR. J. A. LEACH

The Victorian Naturalist

VOL. XLV—No. 1.

MAY 9, 1928.

No. 533.

THE FIELD NATURALISTS' CLUB OF VICTORIA.

The ordinary monthly meeting of the Club was held in the Royal Society's Hall, Victoria-street, Melbourne, on Monday, April 16th, 1928. The President, Mr. E. E. Pescott, F.L.S., occupied the chair, and there were about 120 members and visitors present.

REPORTS.

Reports of excursions were given as follow:—Lilydale, Mr. F. Chapman, A.L.S., F.G.S.; Burnley Gardens, Mr. E. E. Pescott, F.L.S.; Macedon, Mr. V. H. Miller; Forrest, Mr. H. B. Williamson, F.L.S.; and St. Kilda Gardens, Mr. V. H. Miller.

ELECTION OF MEMBERS.

The following were duly elected on a show of hands:—As Ordinary Members:—Miss V. E. Carter, Threadneedle-street, Balwyn; Miss Collier, 26 Jolimont Terrace, Jolimont; Misses L. and I. Reichert, 102 Albert-street, Footscray; Mr. A. R. Arnold, 95 Maribyrnong-road, Ascot Vale; and Miss A. M. Creaton, 95 Queen-street, Melbourne; and as a Country Member:—Mr. W. Champion Hackett, Dequetteville Terrace, Kent Town, Adelaide, S.A.

GENERAL.

The President referred to the approaching marriage of the Hon. Treasurer, Mr. A. G. Hooke, and spoke in eulogistic terms of the valuable services rendered to the Club by Mr. Hooke during the past five years. On behalf of members, the President then presented to Mr. Hooke a pair of silver-plated entree dishes, as a token of esteem and appreciation. Mr. G. Coghill, a former Treasurer, supported the President in wishing Mr. Hooke every happiness and prosperity in his future life. Mr. Hooke responded in suitable terms.

The President extended a welcome to Mr. J. R. Kinghorn, President of the Zoological Society of New South Wales, and Mr. Clive Lord, Director of the Hobart Museum. Both gentlemen responded briefly.

Notice was given by the President of the following motion to be submitted to the May meeting of the Club:—“That Mr. R. D. Elliott be elected a Honorary Life Member of the Club, in view of his interest in obtaining a gift of £200 to the Club, for special biological field work.”

LECTURE, ETC.

The President extended a cordial welcome to Dr. T. D. A. Cockerell, Professor of Zoology at the University of Colorado, U.S.A., who was on a visit to Australia, and who had kindly consented to give an address before the Club. After acknowledging the welcome, Dr. Cockerell delivered a very interesting and instructive lecture, in the course of which he touched on many aspects of scientific work in various parts of the world, and made several valuable suggestions regarding the popularising of natural history.

EXHIBITS.

By Mr. A. J. Tadgell.—Plant specimens collected on Fainter High Plains, in January, 1928 (mostly restricted to the Alps at about 5,000 feet):—(a) Velvet Wheat-Grass, *Agropyrum velutinum*, an alpine grass, very rarely collected in Victoria, as it seems to be restricted to a radius of a few miles in the Alps. (b) Tasman Plantain, *Plantago Tasmanica*—*T. Gunnii*, and a variety (*antarctica*). Both forms, strangely, are found not uncommonly growing in close association; usually the type form may be looked for on the hillsides and the variety in or near water. The type form has woolly, hairy, grey, broad leaves, lined and toothed; the variety form has shining, bright green, not very hairy, almost entire leaves, that give the plant a glabrous appearance. (c) Fir Clubmoss, *Lycopodium Selago*. An unusually fine specimen, with stems $7\frac{1}{2}$ inches in length. (d) Hedge-hog Grass, *Echinopogon ovatus*. This rough bearded scabrid grass, never abundant, is usually found in the forms with nearly leafless stems, from the sea to the Alps. The unusual form found at about 4,000 feet has large lanceolar leaves, abundant on the stems.

By Dr. Heber Green.—Herbarium specimens of "Gully Gum," *Eucalyptus Smithii*, R. T. Baker, collected seven miles beyond Nowa Nowa, April, 1928; also fresh specimen of "Spotted Gum," *Eucalyptus maculata*, from Melbourne Botanic Gardens.

By Mr. H. B. Williamson, F.L.S.—Herbarium specimens of (1) Bentham Bush-pea, *Pultenaea Benthamii*, F. v. M., collected at Bairnsdale by Mr. T. S. Hart, M.A. (previously recorded only from the Grampians). (2) Specimens of the seven Victorian species of Water Milfoil (*Myriophyllum*). (3) Fresh specimens of Ivy Duckweed, *Lemna trisulca*, L., collected in the Upper Barwon

at Forrest, April, 1928. (4) Photos. taken at Easter "Camp-out" at Forrest.

By Mr. C. Daley, B.A., F.L.S.—Specimens of Grampians Sandstone, from Mt. Abrupt to Mt. Arapiles. Also 10 sketches taken on Western District Excursion, October, 1927.

By Miss E. Raff.—Specimens of Waxberry, *Gaultheria hispida*, Rough Coprosma, *C. hirtella*, Elderberry *Panax Tieghemopanax sambucifolius*, and "Tatoon," *Leptospermum flavescens*, collected at Mt. Buffalo, April, 1928.

By Mr. D. Blair.—Specimens of *Correa rubra* and *Olearia ramulosa*, from Merri Creek, Coburg.

By Mr. A. E. Opperman.—Flowering sprays of Fairy Waxflower, *Eriostemon obovalis*, from Castlemaine, April, 1928.

By Miss G. Nokes.—Flowering spray of *Hakea laurina* grown at Montmorency.

By Mr. V. H. Miller.—Specimens of *Pterostylis obtusa*, from Fern Tree Gully, April, 1928.

By Mr. F. G. A. Barnard.—Specimens of *Acacia stricta*, showing pinnate form of leaves.

By Mr. E. E. Pescott, F.L.S.—Specimens of (a) *Plectranthus parviflorus*; (b) dried specimens of *Pterostylis obtusa*; (c), specimen of *Caladenia* from Mt. Zero. Aboriginal implements from Lake Lonsdale, collected on Western District excursion, October, 1927.

By Mr. C. French, Jr.—Two cases showing specimens of Freckled White Butterfly, *Callidryas pyranthe*, collected at Shepparton, Harcourt, and Coburg, April, 1928. Also 50 species of Australian bees and about 200 species of Australian scale insects, found on forest trees, etc.

By Mr. H. P. McColl.—Garden-grown specimens of *Acacia rhetinodes*, *Eucalyptus torquata*, *Stenocarpus sinuatus* and *Callistemon lanceolata*.

Mrs. J. G. Coleman, of Blackburn, is anxious to hear from anyone who is willing to sell copies of the *Southern Science Record*, or any reprints containing original articles on Australian Orchidaceae. She also wishes to purchase Vol. VI. of *Flora Australiensis*, and No. 1, Vol. I.; No. 4, Vol. II.; and No. 4, Vol. IV., of the *Victorian Naturalist*.

THE LILIES OF VICTORIA.

BY H. B. WILLIAMSON, F.L.S.

PART I.

The plants belonging to this group have always been favourites, and in the garden include the Hyacinth, Tulip, Tiger Lily, Agapanthus, Tuberose, Butcher's Broom and other attractive plants, while among edible plants and plants used for fibre, Onion, Garlic, Asparagus and New Zealand Flax (*Phormium*), stand as examples. "Trumpet Lily," "Belladonna Lily," "Murray Lily," of the Riverina are misnomers, as they do not belong to the family *Liliaceae*. About 150 genera, containing upwards of 1,400 species, have been enumerated, but Australia has only about 150 species. Victoria has 26 genera, with 47 species, 16 of the 26 genera being represented by only one species each. While in some of the other States there are species with showy individual flowers, for example, the beautiful Blandfordias of New South Wales and Tasmania, our lilies do not, as a rule, specially appeal to the eye, except when in masses or clusters, which is rarely the case. About 30 have small or very small flowers of a white, pale pink, or pale blue colour; 10 are yellow, and 7 a bright blue, many of the flowers being less than an inch across, and not occurring in clusters or masses, as is the case with some other families.

Four of the species are climbers or twiners, which scramble to great heights among tall vegetation. Our Grass-trees, one of which produces a thick trunk, belong to this family, though once included in *Juncaceae*, in which family Bentham also placed our Mat-rushes, *Lomandra*. The most showy of the family have bright blue flowers—the common Nodding Blue-lily, and the Blue Tinsel Lily of the Grampians. The majority are herbaceous plants, and though their small flowers are not so varied in form as the orchids, they are none the less beautiful, especially the lovely, delicate Fringe-lilies, the dainty little Blue Squill, and the children's favourite, Early Nancy, while the brightly-coloured berries of Torquise Berry, Wombat Berry, and the Flax-lilies, help in their way to give charm to the bush in Autumn.

It is remarkable that of our recorded Australian species, only 12 are found outside our continent and Tasmania, eight of them extending to Asia, 3 to Africa, 6 to Polynesia, and 2 to New Zealand. Only 3 of our Victorian species occur outside Australia—*Geitonoplesium*

to Asia and Polynesia, *Eustrephus* to Polynesia, and *Herpolirion* to New Zealand.

CHARACTERS OF LILIACEAE.

Leaves mostly parallel-longitudinally veined, rarely net-venuled. Corolla and calyx divided into 3 petals and 3 sepals, the latter petal-like. Stamens usually 6, attached to the base or below the ovary. Some botanists speak of "a perianth of 6 segments," instead of 3 petals and 3 sepals, but, although the petals and sepals are similar, one can always distinguish the three outer ones as the only ones to be seen in the bud stage of the flower, hence the idea of a calyx.

KEY TO THE GENERA.

1. Tall climbers or twiners 2
Erect or spreading plants 6
2. Leaves very firm, with 3 or 5 main veins 3
Leaves thin, streaked with many fine parallel veins 4
3. Leaves with usually 5 main veins, tendrils present, flowers
in umbels *Smilax* 1 sp.
Leaves with 3 main veins, no tendrils, flowers in racemes
Rhipogonum 1 sp.
4. Leaves broad-lanceolate, petals fringed, flowers on axil-
lary stalks *Eustrephus* 1 sp.
Leaves narrow-lanceolate, petals fringeless, flowers in
cymes or umbels *Geitonoplesium* 1 sp.
5. Style, three-cleft 6
Style, undivided 11
6. All flowers with stamens and pistil 7
Staminate and pistillate flowers, mostly on separate plants 9
7. Fruit, a blue berry *Drymophila* 1 sp.
Fruit dry, indehiscent 8
8. Leaves short and broad, flowers terminal, solitary or two
together *Scheuchzeria* 1 sp.
Leaves, long and narrow, flowers in terminal umbels
Burchardia 1 sp.
9. Root bulbous, flowers sessile, few, white, with dark bands
across the segments *Anguillaria* 1 sp.
Root thick, producing strong fibres 10
10. Leaves rather soft, somewhat succulent, silky, with soft
hairs, perianth segments not coherent. Alpine plant
Astelia 1 sp.
Leaves rigid, almost dry, flowers usually very small, Sepals
and petals often connate at the base *Lomandra* 9 spp.
11. Flowers white, very numerous, sessile, crowded into a
dense cylindrical spike, "Grass-trees" *Xanthorrhoea* 3 spp.
Flowers stalked, dispersed or clustered 12
12. Filaments swollen or bearded 13
Filaments capillary or smooth 17
13. Filaments swollen, rigid plants, with long, narrow, basal
leaves *Dianella* 3 spp.
Filaments bearded 14

14. Sepals and petals spirally twisted after flowering *Tricoryne* 1 sp.
 Sepals and petals remaining straight 16
15. Flowers bright yellow, in racemes, rather succulent
 plant *Bulbine* 2 spp.
 Flowers blue or pale 16
16. Anthers soon recurved. Shrubby or tufted plants, with
 rigid leaves *Stypandra* 2 spp.
 Anthers remaining straight, leaves lax, roots tuberously
 thickened *Arthropodium* 2 spp.
17. Anthers with a small tuft of hairs at the base
Dichopogon 2 spp.
 Anthers not crested at the base 18
18. Petals much fringed *Thysanotus* 4 spp.
 Petals fringeless 19
19. Stems branchless, or nearly so 20
 Stems well branched 23
20. Flowers solitary, dwarf alpine plant *Herpolirion* 1 sp.
 Flowers several or many, in the inflorescence 21
21. Pollen-bearing anthers, 3 *Sowerbaea* 1 sp.
 Pollen-bearing anthers, 6 22
22. Flowers few, in a terminal corymb, bright blue, with
 yellow anthers *Chamaescilla* 1 sp.
 Flowers many, in an extended raceme *Cucsis* 2 spp.
23. Sepals and petals spirally twisted after flowering
Corynotheca 1 sp.
 Sepals and petals remaining straight 24
24. Flowers singly terminal, perianth blue, shining, persist-
 ent, everlasting *Calceolaria* 1 sp.
 Flowers in terminal heads 25
25. Rigid plant, with flowers in dense ovoid heads and en-
 closed by stiff, brown bracts *Borya* 1 sp.
 Soft plants with flowers in loose heads with shining,
 scarious bracts *Bartlingia* 2 spp.

Genus SMILAX.

SMILAX AUSTRALIS, R.Br. Austral Sarsaparilla, Fig. 1.

A tall climber, with branches beset with short prickles, and provided with tendrils. Leaves on short stalks, broad, entire, 2-3 inches long, very firm, with 5 prominent veins, net-venuled between. Flowers on umbels on long stalks, very small, greenish or slightly reddish. Fruit a globular black berry. This is one of the plants that help to form the tangle of stems in creek bottoms of East Gippsland, known locally as "jungles." These jungles remind one of the scenes depicted of South American forests, where lianas or vegetable cables, epiphytal orchids, jaguars, and monkeys, are the chief features. They are apparently confined to the country East of the Snowy River, to which district this plant is also restricted. It is found also in N.S.W. and Queensland.

The roots of some species of this genus furnish a drug known as Sarsaparilla—Spanish *sarza*, a bramble, *parilla*, a vine—of which there are several kinds, with properties varying according to the species from which it is obtained.

Genus RHIPOGONUM.

RHIPOGONUM ALBUM, R.Br. White Supplejack. Fig. 2.

This is another of the "jungle" plants, and stems 30 or 40 feet long may be found hanging from tree tops or crossing each other in fantastic loops. It differs from *Smilax* in having leaves with only 3 prominent veins, in the absence of prickles on the smaller branches, the entire absence of tendrils, and in its much larger whitish flowers in racemes 3 to 4 inches long, and the fruit is not black, but dark red. Distribution the same as that of *Smilax*.

Genus EUSTREPHUS.

EUSTREPHUS LATIFOLIUS, R.Br. (*E. Brownii*, F. v. M.)

Wombat Berry. Fig. 3.

A climber much less robust than the two preceding, with thin lanceolate leaves, almost sessile, gradually tapering to a point and streaked with many fine parallel veins. Flowers are rather small, dull purplish or pale pink arranged in clusters on long stalks in the axils of the leaves. Filaments are connate into a membranous tube, and the petals are somewhat fringed. The berries are rather large, globular, and of an orange colour. It extends further west than *Smilax* and *Rhipogonum*, and has been found near Lake King. Occurs also in N.S.W. and Queensland.

Genus GEITONOPLESIMUM.

GEITONOPLESIMUM CYMOSUM A. CUNN. Scrambling Lily.
Fig. 4.

Much like *Eustrephus* in habit, and in its finely streaked, almost sessile leaves, but the leaves are always narrow, and the flowers are in stalked cymes or umbels. Sepals and petals are greenish, the latter not fringed, and the filaments are disconnected. Fruit globular, bluish-black. Distribution the same as *Eustrephus*.

Genus DRYMOPHILA.

DRYMOPHILA CYANOCARPA, R.Br. Turquoise Berry.
Fig. 5.

Stem about 1 foot high, branches, or with a few



1. *Smilax*. 2. *Rhipogonum*. 3. *Eustrephus*. 4. *Gentrop-lesum*. 5. *Drynophila*. 6. *Schellhammera*. 7. *Burchardia*. 8. *Anguillaria*. 9. *Astelia*.

branches on the upper part. Leaves placed vertically, sessile, narrow-lanceolate, to 3 inches in length, finely streaked with veins. Flowers white, on stalks turned somewhat downwards. Style divided into 3 branches. Berry globular, or nearly ovate, blue, with from 8 to 20 brown seeds. A very pretty little plant, whether seen in flower or with its showy berries ripe. Found in all districts except the North-West; also in Tas. and N.S.W.

Genus SCHELHAMMERA

SCHELHAMMERA UNDULATA, R.Br. Lilac Lily. Fig. 6.

A plant with the habit of *Drymophila*, but rarely above 6 inches in height, often diffuse, usually branched. Leaves sessile, somewhat clasping, 1 to 2 inches in length, membranous, with rather prominent veins, and margins minutely undulate. Flowers rather large, on long, straight stalks. Sepals and petals spreading, pale lilac. Anthers rather large, dark purplish. Fruit slightly three-lobed. East Gippsland, not common (Bemm River, Snowy R., Howe Hill). Also in N.S.W.

Genus BURCHARDIA.

BURCHARDIA UMBELLATA, R.Br. Milkmaids. Fig. 7.

Herb, from 1 to 2 feet high, with fibrous roots, and simple or slightly branched stem, with a few narrow leaves. Flowers fragrant, in a terminal umbel, sometimes more than one, a few outer bracts forming an involucre. Sepals and petals white, sometimes pink tinged, nearly equal, spreading, flat when in flower; ovary and fruit sharply triangular, much pointed. One of the commonest of our native flowers; occurring in all districts, also in all other States.

Genus ANGUILLARIA.

ANGUILLARIA DIOICA, R.Br. (*A. australis*, F. v. M.)

Early Nancy. Fig. 8.

Always branchless, from 3 inches to over a foot in height. Root bulbous. Leaves few, linear, some dilated at the base into a broad loose sheath. Flowers sessile along a stem, which is often flexuose. Sepals and petals white, with usually a dark band below the middle. Male and female flowers are on separate plants (dioecious), hence the species name. Female flowers are known by the dark coloured, slightly-lobed ovary, surmounted by the 3-branched stigma (8a). Occasionally plants with both staminate and pistillate flowers can be found, illustrating what Baron von Mueller once called the "playfulness of this pretty, and in many respects remarkable

plant." The species is variable, and includes one-flowered specimens a few inches high, and robust plants over a foot in height. It has been called "Harbinger of Spring," as it is one of our earliest Spring flowers. It occurs in all parts of the State, and in all the other States.

Genus *ASTELIA*.

ASTELIA ALPINA, R.Br. Perching Lily. Fig. 9.

A densely tufted, almost stemless plant with leaves from 3 inches to a foot long, rather stiff, beset with silk-like hairs which are very copious on the broad, sheathing bases of the leaves. Male flowers are in a loose panicle a few inches long. Female flowers are condensed into a cluster almost hidden by the leaves. Fruit almost ovate, red. A strictly alpine plant—Australian Alps, Baw Baws, Mount Wellington, Mount Mueller. Also in Tas. and N.S.W.

EXCURSION TO CAVE HILL QUARRY, LILYDALE.

Twenty-two members and friends took part in the excursion on March 17. On our walk to the quarry, it was noticed how fertile the surrounding country appeared, especially after the late season's rains. Since our last visit great improvements have been made in regard to handling the lime and limestone, but as the works were shut down for the afternoon, our attention was turned from the economic to the scientific side of the Cave Hill Quarry.

A short address was given by the leader at the edge of the quarry, before the party descended to collect specimens. He briefly described the relations of the Silurian rocks of mudstone, shale and limestone around Melbourne, the fossil remains which are found in those rocks, and the wonderful inter-relation between the Silurian of South-eastern Australia, and that of other more remote parts, such as North America, Scandinavia, and Great Britain. It was pointed out that here we have an undoubted coral reef, notwithstanding some opinions to the contrary, for the corals themselves are seen in place on the bedding planes, exactly as when living.

Collecting was carried on with enthusiasm, as the sound of the hammers re-echoed around the quarry. Some of the more notable finds of corals were—*Cyathophyllum* (a cup-coral); *Favosites* (honey-comb coral); and the hydroid coral (*Helolites*). One of the lamp shells found belongs to the widely distributed genus *Atrypa*. Several specimens of the curious periwinkle-like gastropod, *Cyclonema*, were discovered, and one of them was seen to be surrounded with the parasitic hydroid, *Clathrodietyon*. Many of these hydroid, or stromatoproid corals, were collected, and it is hoped that some will give us new fossil evidence. During the afternoon a remarkable block of limestone was found, which consisted of a closely felted mass of lime-secreting algae. This alone would afford much material for future research for palaeobotanists.

An interesting feature, noticed in several parts of the quarry, was the occurrence of distinct ripple structure on the faces of limestone rocks which were apparently bedded.—F. CHAPMAN.

EASTER CAMP-OUT, EXCURSION TO FORREST.

On April 6th, a party of six travelled by van to Forrest, to spend a few days in camp there and examine the country near the head of the Barwon and Gellibrand Rivers. Passing through the open country beyond Geelong, after skirting the picturesque Barrabool Hills, with their winter carpet of green already spread, Manna Gums, *Euc. viminalis*, in scattered clumps, and River Red Gums, *E. rostrata*, along the watercourses, constitutes the tree vegetation until within a few miles of Winchelsea some fine groves of Drooping Sheokes, *Casuarina stricta*, were passed through. May they long stand to be admired by lovers of typical Australian vegetation beside this much-travelled highway. It is not till one has left Birregurra well behind, and Barwon Downs is approached, that the true forest flora is reached, Messmate and Common Peppermint being the principal trees. The road here is in places a mere bush track, and in some places very steep. Silky Tea-tree, Narrow-leaf Acacia, and dwarf Banksia, interspersed with Common Epacris, form the undergrowth. Occasionally early flowers of the last named appeared like fiery torches above the other scrub, and here and there the Showy Guinea-flower peeped through the tangle.

A long hill leads down to the Barwon Valley, near Forrest, and in a bend of the river sheltered by willows an ideal spot for a camp was found. These willows, *Salix alba*, are growing right in the bed of the stream, and are throwing out stems 30 or 40 feet long almost horizontally over the grassy banks, now carpeted with many discarded leaves. The valley floor is deep alluvial covered with rich pasture, including such good fodder plants as clovers, rib-herb, and the native Bird's-foot trefoil. Thistles and the foreign pest, Ragwort, *Senecio Jacobaea*, now in flower, are in evidence, but the latter does not monopolise the paddocks to the exclusion of better plants. There was, as usual, plenty of Dock and Fog grass. Where willows have not taken possession, the following plants are growing in the water, and in some places almost filling it up:—*Ranunculus rimularis*, quite submerged, among which masses of *Lemna trisulca* are entangled, *Ottelia ovalifolia*, with its large, oval floating leaves, but no flowers, *Callitriche verna*, a large-leaved form, also without flowers or fruit, and the alien. *Nus-*

turtium officinalis, Water Cress, in abundance, *Polygonum minus* and *P. hydropiper*, were also very prevalent, and *Brunella vulgaris* was flowering freely.

Joined by five lady members, who were staying at the hotel, we traversed a mile of this open valley before we reached the more attractive upper reaches of the river. Just before entering the haunts of Musk Daisy-bush, Hazel Pomaderris, and Austral Mulberry, I was pleased to recognise an old acquaintance in the shape of a splendid specimen of Manna Gum, which stands as it did 15 years ago, when I estimated its height to be 220 feet from a photograph I took showing my companion standing at the foot. It apparently owes its preservation to the fact that it is on private property. Looking at the tall, white-barked giant, we could hardly believe that it was really the same species as the bushy, rough-barked specimens we had seen near Winchelsea. Now we were for several miles shut in from bright sunlight, walking along the mill track, which was cut into the hill, now on the right hand, now on the left, as the track crossed the river here and there. As an engine and motors are used on these rails, it is not necessary to have sleepers so close as for horses, so the crossings were negotiated at some risk, as the beams and sleepers were slippery, and a complete collapse would mean a fall of some 10 feet or more into the river. The side of the cutting was as interesting as the fern-filled river bed, and along this was seen a great quantity of the Liverwort, *Lumularia cruciata*. Like *Marchantia*, this plant is common near Melbourne, even in the suburban gardens, and is distinguished from *Marchantia* by its crescent-shaped receptacles for the gemmae, but none of us had seen before the delicate archegonia, with their cross-branched spore cases *Viola hederacea*, *Siegesbeckia*, *Cynoglossum latifolium* and *Geranium pilosum*, in good bloom grew abundantly along this bank, while the sweet odour of *Senecio dryadeus*, not in bloom, was quite distinct all along the track. The scent of this plant is apparent in specimens that have been dried for many years. On the river side of the track, besides the large shrubs of Hazel, Mulberry, Musk, etc., the Scrub Nettle, *Urtica incisa*, a native plant with virulent poison hairs, and its ally, the Smooth Nettle, *Australina*, with no stinging hairs, were very frequent. Fifteen species of ferns were

gathered here, the rarest being *Hypolepis tenuifolia*, fruit of which was just sufficient to make out the species.

Coprosma hirtella and *C. Billardieri* were found in fruit, and the pretty orange berries of the former were much admired. The large blue pods of *Billardiera longiflora*, with ripe seeds, were carefully put away for future experiment. On the Monday a walk to Barramunga, along the Apollo Bay Road, gave the party an opportunity of enjoying a wide view, and Mount Sabine, the highest part of the Otway Range was easily picked out, while the ridge along which the old many-branching coach road winds, and which divides the head waters of the Barwon and the Gellibrand Rivers, was clearly visible. From the Barramunga Hotel we followed a steep path to a saw-mill lately damaged by fire, and now being demolished, thence along an old mill track also being taken up, to a pretty waterfall on the Barramunga Creek, an affluent of the Gellibrand. The water drops over a rock about 50 feet, into a pretty little pool, and becomes lost to view in the forest of tree ferns. Photographs were taken from a small ledge of rock just below the track. In muddy depressions along this track, *Callitriche Muelleri*, was gathered in fruit. The additional species of ferns seen here made our fern census up to 20. One of the features of the Apollo Bay Road is the presence of the introduced alien, *Hypericum Androsaemum*, Tutsan, or Park Leaves. It is a beautiful shrub, with large opposite leaves, often tinged with red, and orange-yellow flowers, which has for years been spreading in the forest, and is deemed a pest by the landholders, though apparently not so difficult to deal with as its ally, *St. Johns Wort*. Other plants seen in bloom were *Boronia parviflora*, *Hypericum gramineum*, *Goodenia ovata*, *Olearia ramulosa*, and *Spyridium parvifolium*.

Birds:—Miss Wigan reports that 40 native species were noted, the most interesting being the Pink Robin and the Bronzewing Pigeon. The most common of the larger birds was the White-backed Magpie, and of the smaller ones, the Blue Wren. Red-browed Finches and White-shafted Fantails were seen, and the Nankeen Kestrel, Brown Hawk, and Swamp Harrier, were watched with interest.

The fine weather experienced, and the splendid camp organisation, under Mr. V. Miller, combined to make the trip a most enjoyable one.—H. B. WILLIAMSON.

ROCK CARVINGS AT MOOTWINGEE, N.S.W.

BY P. D. RIDDELL.

In the central parts of this country there is still to be found much evidence of its occupation by a people of the Stone Age. Their stone implements, such as grinding mills and pounders, stone axes, quartzite knives, and chippings of various designs, have been left lying about, while the much-discussed cornute and cylindrical "ceremonial" stones can still be found in the country south-east of Cooper's Creek and along the Darling River Basin. As regards the latter, so far back in antiquity were they used, it is doubtful whether their purpose will ever be definitely known.

Boomerangs, spears, waddies, dishes, etc., are frequently met with, though time is bringing about their decay. The stone implements, of course, are not affected in the same way; yet even these are showing signs of weathering.

Further evidence of the occupancy are the carvings upon rocks. There are many areas where these carvings (petroglyphs) are to be seen. One very fine example of the aborigines' art is at Mootwingee, about 84 miles north of Broken Hill, N.S.W., and about the same distance from the South Australian border. Realising its scientific value to future generations, and to check, if possible, the vandalism which is already taking place, the Field Naturalists' Club of Broken Hill made representations to the State Government to have proclaimed a reservation, that portion in which the carvings occur, with a view to their preservation. It was gazetted a reservation early in 1927.

The Mootwingee Range is Devonian in origin. The gorges are flanked with dense sandstone, along the bottom of which are to be found rock waterholes of great capacity. A few points of rain serve to replenish these holes, since the large quartzite slopes are effective catchment areas. Not only did it supply the daily needs of the aborigine in the way of water, but brought within his easy reach many birds and other animals. With an assured water and food supply, the Mootwingee hills became a permanent camping ground.

When the seasons of plenty made the chase less arduous, and gave him periods of leisure, we find the aborigine's primitive artistic sense gaining expression in cave paintings and rock carvings. He was a being of infinite patience, many of the carvings representing much

labour. He invariably picked a rock that could be worked with an easy sitting posture. On the walls of a cave, formed by the crumbling away of the soft sandstone, and providing in rainy weather an acceptable shelter, are to be seen many "paintings." The method apparently was to place the object to be portrayed against the damp, light-coloured sandstone and blow from the mouth red ochre finely powdered. This gives the effect of a white hand (which is the predominating object, though there are to be seen others) upon a dark background. It is probably many years since the work was done, yet the "paintings" are indelibly affixed to the cave walls.

The hillside where occur the carvings detailed in photographs accompanying this article, is the end of the gorge, of which the cave is the commencement. It is interesting to note the effect of weathering on this huge area of surface sandstone. In some cases the rocks have cracked, and large portions slipped bodily as much as 6 inches to 12 inches. This can be seen in one of the illustrations. The carvings have been made on the sandstone, on the surface of which is a film of much harder stone, by probably a piece of flint or some such material. The effect has been produced by a "pecking away" of the face of the rock, with no attempt at finishing off. In another place the rock area was apparently conveniently placed, for there is to be found much work over a very long time, the newer being mixed with the old, so as to make many carvings indecipherable. Many of these appear to be of great antiquity.

In the Mootwingee area the objects depicted, with the exception of the human figure which occurs frequently, are mostly connected with the chase, first the weapons used, then the birds and other animals, and their trackings, by which his daily larder was replenished. One carving is a fine representation of a Kangaroo, which is approximately 3 feet 6 inches from tail to head.

Pictures of mammals and birds, and their trackings, together with the weapons of the chase, appear to be common to all areas in these parts; but whereas the human figure is freely depicted in the Mootwingee carvings, in other areas it is missing. Other forms take its place. For instance, among the carvings on Sturt's Meadow holding are to be found many designs of the circle, but nothing of the human figure. And at Mootwingee there are no adaptations of the circle. All areas appear to have designs peculiar to each.

AUSTRALIAN PSELAPHIDAE.

BY F. ERASMUS WILSON, F.E.S.

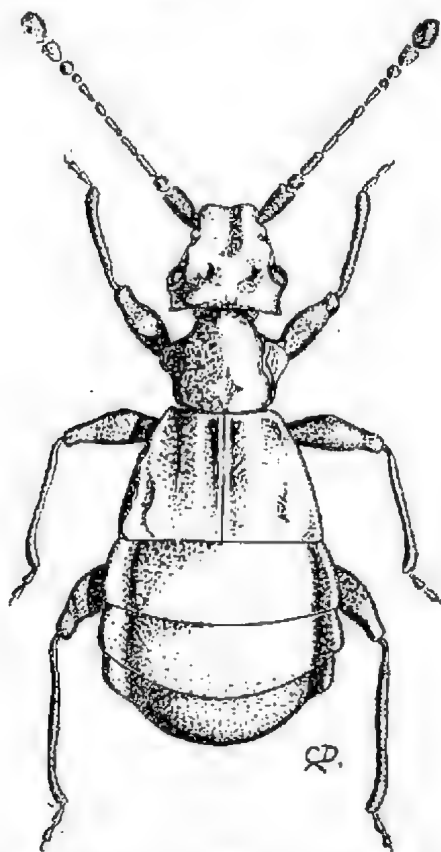
Few, if any, families of beetles present such striking diversity of form as may be found in the *Pselaphidae*, but, owing to their minute size, very few people are at all familiar with them. Were they beetles half an inch or more in length, probably no coleoptera would be so much sought after by entomologists. In Australia the species range in size from less than a millimeter to four and one-half millimeters, and it is doubtful whether any known Pselaphid exceeds five millimeters in length. Up to the present 423 species have been described from this country.

These beetles are found in most parts of the world, and some genera such as *Pselaphus*, *Rhybaris*, etc., are very widely distributed. When the Australian Pselaphid fauna has been thoroughly worked out; probably no other country will be able to record a greater number of species. As far as I am aware, no true fossil Pselaphidae have been described, but at least one species, *Articerus armatus* Dalm, is known from copal gum.

Pselaphidae may be found almost anywhere, but, of course, certain locations are much more productive than others. Ants' nests shelter many species, and a few are also known to associate with *Termites*. They occur also amid rotting leaves, in moss growing on the ground, or on trees and old logs, in tussocks of grass, and under stones and logs in damp situations, even under the bark of trees.

The uninitiated may ask: "How are we to find these minute beetles in a heap of rotting leaves or in a great tussock of grass?" Adopting the right methods, the search is simple. From a single tussock, a small bundle of moss, or leaf debris, numerous Pselaphidae may often be secured. A tussock to be examined is cut off at ground-level with a sharp knife, or other suitable instrument, and teased up over an umbrella or sheet of cloth or paper, and all the coarse material discarded. The detritus left over is bagged up and taken home for further examination. If damp and cold, it is advisable, first to warm it, which renders the insects more active, and therefore more easily detected, and also partially dries the mass, making its treatment more convenient.

The next proceeding is to sieve the material, a handful at a time, through a fine sieve, or a series of sieves, distributing the sievings well over a large sheet of paper during the operation. All that is required now is a good light and a sharp pair of eyes. The tiny beetles, probably indignant at the treatment they have received, begin to move about, when they are easily detected and captured. Leaf mould, moss, etc., are dealt with much in the same manner, as a grass-tussock is examined.



Pselaphus strigosus, Wilson. Approx. x 32.

Most *Myremecophilus* species are generally secured from those ants' nests, which are hidden under stones or pieces of wood, as an examination of some of the nesting galleries is usually possible by simply raising the

covering medium. Mr. J. Clark, when in Western Australia, and Mr. C. Oke, in Victoria, have also met with a good deal of success in digging out mounds and following up the galleries. This work, of course, is much more difficult, and entails special methods of procedure.

Certainly no method of collecting *Pselaphidae* gives such prolific results as an examination of recent flood debris, particularly where floods have traversed grassy flats and thickly scrubbed country. Another means of capturing these insects, employed by entomologists, is to sweep with a net the tops of long grass and other low-growing herbage, and examining the tops of fence-posts just at dusk. Most insects like a vantage point from which to launch forth on their evening flight, and so they ascend grass stalks, fence-posts, stumps, etc., for the purpose. By taking advantage of this habit, many fine *Pselaphids*, and also other beetles, have been added to my collection. Some species are attracted to lights, particularly in the warmer parts of this country. In Victoria, the only species I have obtained in this way has been one of the commoner forms of *Pselaphus*.

Regarding the food of these beetles, beyond the fact that the *Clavigerides* are fed by their hosts mainly with regurgitated food, very little is known for certain. In the case of the true *Pselaphids*, however, wherever their habitat, there also will be found still smaller forms of life, such as mites, tiny beetles belonging to the families *Trichopterygidae* and *Corylophidae*, minute larvae of various kinds, *collenibola*, etc.; and undoubtedly the *Pselaphids* gain their sustenance by preying upon some, if not all, of these. I have never actually witnessed a *Pselaphid* with prey in its mandibles.

The family is divided into two main groups, the *Pselaphini* proper, and the *Clavigerini*, the latter group being entirely myrmecophilus, or dwellers amongst ants. Their antennae are composed of from 2-6 segments, and their mouth parts are atrophied, and not, or poorly, suited for mastication. The well-known British species, *Claviger testaceus*, Pasc, is blind; but, so far, no blind species has been recorded from Australia. Our *Clavigerini* are referred to two genera, *Articerus* and *Clavigeropsis*, the latter genus containing but one species, *C. australiae*.

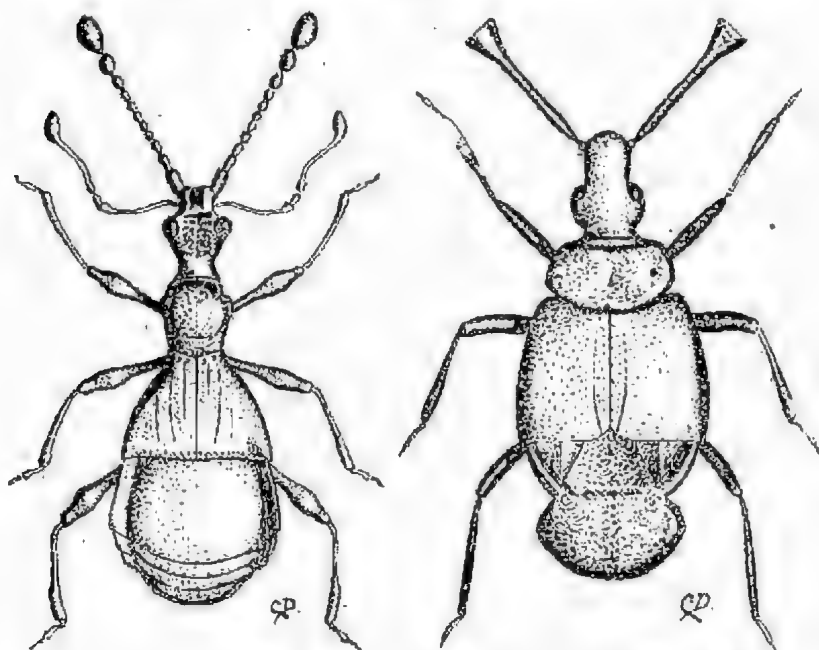
Lea. This is a very rare insect, known only from New South Wales and Queensland. An example occurred to me when collecting at Barrington Tops, N.S.W., at an elevation of about 5,000 feet. *Articerus*, on the other hand, is a strongly represented genus, some 47 species at present being known, with more still to be described. The genus is found all over Australia, and in Tasmania, but Western Australia seems to be the home of the finest species.

Articerus species may frequently be found on the undersurface of stones covering ants' nests, or in the nesting galleries, and are rather slow in their movements. They are cared for by the ants, and in one or two instances I have seen ants seize them and take them down into the nest. To my knowledge, at least one species leaves the ant's nest for mating purposes, viz., *A. Wilsoni*, Lea, and it is probable that others, if not all, do so.

At Eltham, in the early spring, I found several examples of *A. Wilsoni* under stones and bits of wood, which were not in any way connected with ants' nests; but always at no great distance from a mound of the ubiquitous meat, or gravel bed ant, *Iridomyrmex detectus*, Sm. I strongly suspected that this ant was the species host, but owing to the difficulty of examining detectus nests, it was some time before I could prove it. Eventually I hit upon the plan of embedding large stones in the mound, and leaving them undisturbed for about two months. In the meantime, the ants excavated the earth from beneath the stones, so that, when the latter were later removed, I was able to command a good view of portion of the interior of the nest. The ruse proved successful, and I succeeded in getting three or four specimens of the *Articerus* from within the nest itself.

Another dodge I employed with the same species of ant, when collecting in Queensland, was to hastily scratch a fairly large portion of the mound into an umbrella. At first the umbrella seemed to be a living mass of ants, but as they poured over the sides, it was moved from place to place, till practically free from ants. The remaining earth was then put through a fine sieve, and yielded an example of *A. Wilsoni*.

The Pselaphini proper are themselves divided into two main groups, the *Pselaphini brachyscelidae*, and the *Pselaphini macroscelidae*, based upon the length of their *trochanters* and the method of insertion of the femora upon them. Both groups contain numerous genera, and both are also very well represented in Australia. While many of these true Pselaphini are quite normal in form, great numbers of them are most wonderfully armed. This armature takes various forms,

*Nurcodes termitophilus*, Wilson.Approx. $\times 32$.*Articerus nilidicollis*, Raff.Approx. $\times 32$.

and may consist of either tubercles, blunt teeth, spines, or laminated projections; and sometimes two or more of these forms may be found in one insect. Most frequently such armature is confined to some part or other of the feet, but it may be located on almost any part of the body, except the elytra.

Many abnormalities are met with in the antennae, such as excised, distorted, or excessively swollen segments. The Maxillary palpi are also very prone to

exhibit diversity of shape. Their segments may be linear, clubbed, spatulate, curved, spined, or in some way distorted, and these characters are drawn upon very considerably in the classification of the family. An example of a remarkable form of Maxillary palpus, may be seen in the figure of *Pselaphus strigosus*, Wilson. Here it will be noticed to be almost as long as its accompanying antenna. The clothing may also assume several characters, although some Pselaphids are practically nude. Most often it consists of pubescence, but varies from the finest silken down, to strong setae. Some odd genera, such as *Narcodes* and *Ctenisophus*, have a squamose covering.

The tarsi, throughout most of the genera, are normal, but in the *Schistodactylini*, and *Chalcoplectini*, they exhibit a strong deviation. Here the subapical segment is widely bilobed; and the claw segment is inserted upon its base. Claws may be single or double on each leg, but in the genus *Palimbotus*, and some others of the *Tyrini*, it is interesting to note, that the outer claw on the front feet is trifid, whilst the inner one is normal.

The largest genus of the Pselaphini proper, in Australia is *Eupines*, with 74 species, all of which are very small. In this genus the females of many species are so alike that it is impossible to determine them, unless accompanied by their males. The next largest genus is *Rybaxia*, under which heading are grouped 41 species. This genus is found in other parts of the world, and in Australia many fine insects, with remarkable sculpture are associated with it. The world-wide genus, *Pselaphus*, is represented in this country, with some 29 known species. The two most remarkable examples are *biarmatus*, Wilson, found at Fern Tree Gully and Belgrave, and *strigosus*, Wilson, which is here figured, a South Australian moss-frequenting insect.

A most interesting endemic genus is *Narcodes*, seven species of which are known at present. Most of them are inhabitants of grass tussocks, but *oelatommæ*, Lea, is a myrmecophile, and *termitophilus*, Wilson, as its name implies, dwells amongst Termites. The latter species, of which a figure is here given, was one of the prizes captured by my friend, Mr. J. Clark, during his

residence in Western Australia. It is one of the largest of Australian Pselaphidae.

Another well-represented genus is *Palimboldus*, with 19 species, some of which are exceedingly common. In most of the species the males have strongly spurred hind tibiae. Apart from *Articerus Wilsoni*, Lea, *Palimboldus mirandus*, Sharp, is the only species that I have ever observed in Copula.

One of our most remarkable genera is *Daveyia*, formed for the reception of a species *Mira*, Lea, discovered some years ago, near Geelong, and in the Portland district, by that keen Coleopterist, Mr. H. W. Davey. Its eyes are inserted on lateral cephalic projections. Amongst those Pselaphidae having peculiar antennae, none are so quaint as the *Cyathigerini*. The genus *Cyathiger* was originally founded on an Australian species by one of our earliest entomologists, the Ven. Archdeacon King; but while but two species are found in our country, the headquarters of the group was subsequently found to be located in Borneo, Sumatra, and the Malay Peninsula. In *Cyathiger*, the ultimate segments of the antennae are very greatly enlarged and bowl-shaped. The two local species are recorded only from New South Wales; but I have seen an example, collected by the late Mr. F. P. Spry, at Fern Tree Gully, Victoria. Unfortunately, it was so damaged as to preclude definite determination. It was taken in a nest of the ant, *Aphaenogaster longiceps*.

Now, while we certainly know something of the Pselaphidae taxonomically, we know practically nothing as to their life histories, although I do not think we are very far behind other parts of the world in this respect. Who can say that he has seen a Pselaphid egg, larva, or pupa? I, for one, cannot, although I have often seen minute coleopterous larvae which might possibly have been Pselaphid. To work out the home life of such minute forms of life presents many difficulties, besides unlimited patience, but some day, no doubt, the task will be accomplished.

For the three excellent figures accompanying this article, I am indebted to my friend and fellow member, Mr. Cedric Deane. *Pselaphus strigosus* and *Narcodes termitophilus*, are here figured for the first time; while *Articerus nitidicollis* has previously been figured but once, and then in a foreign journal, which is inaccessible to most people.

NOTES ON THE SPELLING OF BOTANICAL
NAMES.

Generic names always begin with a capital letter. A capital letter for a species name is used only: (a) when it is derived from the name of a person. Thus we have *Mitchellii*, *Gunniana*, but not *Tasmanica*, *Asiatica*, *Australiensis*; or (b) when the name of a genus (existing or obsolete) is used as a species name, e.g., *Lagenophora Emphysopus*, *Lycopodium Selago*, *Lythrum Salicaria*, *Eucalyptus Sideroxylon*, *Lythrum Hyssopifolia* (changes in the last two are made in the new Census). Regarding the use of "ii" as a termination to personal names, this is used after all consonants except "r," e.g., *Suttonii*, *Wilsonii*, *Pattersonii*, *Sullivanii*, *Muelleri*, *Tepperi*, but not after vowels, e.g., *Moorei*, *Backhousei*, *Harveyi*. The gender of an adjective species name agrees with that of the generic name, and we follow this rule even when the author of the name did not make the genders agree, e.g., *Isotoma fluviatilis* (f.), *Blechnum fluviatile* (n.), *Culeyana minor* (f.), *Amphipogon strictus* (m.), *Damasonium minus* (n.) (in new Census). The Editor desires that members using botanical names in their contributions or their lists of exhibit would use the Census to check the spelling.

FLORA AND FAUNA OF PORT PHILLIP BAY.

Away back in the "eighties," when the late Mr. Bracebridge Wilson was deeply interested in dredging, the Royal Society of Victoria appointed a Committee to make a "Biological Survey of Port Phillip Bay." In connection with this, most of the collecting was done by Mr. Bracebridge Wilson, mainly in the vicinity of Sorrento; and I think I am right in saying that most of the material collected was sent overseas, to be worked out by European and American naturalists.

In 1890, Mr. A. H. S. Lucas, the Secretary to the Committee, published a paper on some of the fish collected; and in 1891, Mr. (Dr.) A. Dendy made a splendid start on the description of the Victorian Sponges—whether he ever completed the work I cannot say. Would it be possible, at this late date, to find out whether the material sent abroad was ever described and reported upon, and, if so, could these reports be got together in a handy-sized book for the information of present-day workers?

If that R.S. Committee is moribund, and if, with the death of Mr. Bracebridge Wilson, the work was allowed to lapse, could not the F.N.C., as a virile body, take up the task and bring it to a worthy conclusion?

It is a disgrace to us naturalists of Melbourne, that the splendid Bay, lying at our feet, and teeming with living organisms, should have been neglected for so long. Can we not get a good "working section" of the Club to work the Bay systematically, with dredge and tow-net, bringing all the material to a centre (say our National Museum), where it could be sorted out and handed to those capable of describing it?

J. SEARLE.

WILDFLOWERS IN APRIL.

The glorious weather of April lured field naturalists to look for either Autumn spoil or, in the case of botanists, for out-of-season flowers. Not only did the seaside provide specimens of full-blossomed Tea-tree, in *Leptospermum laevigatum*, usually seen between September and November, and the Dandenong Ranges, the Small Tongue-orchid, *Cryptostylis leptochila*, but the hillsides around Whittlesea glowed with abundance of the dwarf Rosy Heath-myrtle, *Basckea ramosissima*, a charming garden plant that we found equally abundant in our November excursion, and usually expected not to exceed the month of January. *Epacris impressa*, in all of its colours, was plentiful, and one could not resist the dainty tubular spikes. Stevenson says: "One is quite satisfied to be alone on a walking tour (but a naturalist is never alone), one can stop or go on, follow this way or that, and go one's own pace, as the freak takes one."

After leaving the car at the bridge over the creek, before one starts the first rise on the further side of Hume Vale, one essays the steep range, pausing at a fallen log to collect the always-welcome little rambling native Tic-trefoil, *Desmodium varians*, with dark clover-like green leaves and dainty sprays of coral-coloured pea-flowers. Like its neighbour in the bush, the pale blue Climbing *Glycine*, it is difficult to induce them to unfold their petals after being cut off their stems.

The way leads down a steep descent towards the water in the creek. Many ferns are seen, as *Davallia*, in pale contrast, *Adiantum*, *Alsophila* and *Doodia*, many of the last being of exceptional width in their fronds, and from the distance resembling the common Fish-bone Fern, found later in the outing. One is delighted with the disappointment however. In the cool, shaded gully, a tall and robust specimen of the May-fly orchid was collected, and later four other species were found, not growing by any means sparsely. The Parson's Bands, *Eriochilus scutellatus*, being just more frequently met with than the usually uncommon Purple Leak-Orchid, *Prasophyllum brachystachyum*, which came plentifully in one situation, 15 plants being found in a group, while 100 plants were examined within a distance of half a mile. The tiny greenhood was a little more plentiful than the *Acianthus*.

Sometimes, a short, straight line walk, will prove longer than a more roundabout way, so down into deep glens, or walking up steep hillsides, are found to be rough going as is the crossing of water-courses. Sometimes a pause is necessary, to take the sun, to ascertain the direction, or time of day, until the old Kinglake road is reached, with the beautiful views of the Plenty Ranges, on the one hand, and the distant Macedon, Blackwood, Brisbane, You Yangs, and other ranges westward. Apple-tree orchards provide a sight to behold, and the prodigal supplies of fruit, that have fallen to the ground, are a feast—but for reflection only. On the dry hillsides the long-leaved *Eucalyptus claesophora* is in flower, and in the lower flats, where moisture abounds, are seen the golden weather-glass amaryllid, *Hypoxis*, found flowering like ground-stars. Not far away, but in drier situations, the yellow Autumn Lily, *Tricoryne*, has many flowers on its long wiry stalks.

One does not see *Aracias* unusually advanced towards flowering, as the country press correspondent led one to believe re-

cently. The long time of development of the buds, perhaps deceived one, not an observer. The graceful, almost evergreen, Weeping Grass, *Microlophus* (*Ehrharta*) *stipoides*, is a grass that never fails to attract, but is attended with disappointment when carelessness is shown in carrying it home, as "it falls to pieces." In the herbarium it does not show its beauty, as when growing, and its graceful symmetry seen. A plant noticed on this outing, *Grevillea ulpina*, had escaped notice on many other Whittlesea walks.

Epacridae were represented, beside the Common Epacris, by *Leuopogon virgatus*, the prickly *Monotoca scoparia*, profusely flowering, and *Acrotriche ventricosu*.

Recent reading, told one that adolescent pleasure, differs very little from childish enthusiasm. Perhaps only in degree. So it is with childish delight, one comes upon out-of-season flowers. There is a Blue Pincushion *Brunonia*, a tree *Helichrysum*, the Bluebell, Forest Mint, the Small Raspberry, the Scented Groundselli, an odd *Tetratheca*, a *Vittadinia*, even the little Bottle Daisy, has its sister, *Lagenophora Billardieri* in attendance. Of course, *Hypericum* and *Leptorrhynchus*, as well as the scented *Drosera*, have shown they are well advanced on the hillsides. But the gem of the outing is the Rosy Heath-myrtle, in abundance, coyly hiding away under the taller undergrowth. *Erlargonium*, *Geranium*, two *Goodenias*, and perhaps the Autumn list is not a bad one, but one needs to be on the alert to find prizes in Autumn amid the coloured foliage.

For the junior members of the Club, there is a quest. The *Hypoxis*, like Yellow Stars, I have referred to, are considered by some botanists to provide us with three species here, two large and one small. Some think that we have only two, a large and a small. By the pocket-lens, it will be seen that there are two anthers, attached to a filament. Note the combination. It is like an arrowhead. Now subdivide the species. One has the anther sacks parallel with the filament, but the other two have the bases of the anthers curved outward from the filament. Which way do the anthers of the Autumn-flowering species lie from the filament?—A. J. TADGELL.

SPECIMENS FOR THE AQUARIUM.

In a letter to the Hon. Secretary, Dr. H. Flecker states that the Secretary to the Exhibition Trustees (Mr. A. C. Sutherland) has expressed his willingness to co-operate in improving the exhibition of living specimens, more especially the invertebrates, in small glass tanks, at the Aquarium. "I feel confident," Dr. Flecker writes, "that with the co-operation of a few enthusiasts, such as might be found amongst the members of your Club, quite a good display of many of the lower organisms . . . as well as many botanical forms, may be permanently exhibited in a living state. Accordingly, I make this appeal to members of your Club to co-operate in an endeavour to improve the exhibits at the Aquarium, and thus assist in instructing the general public, more particularly the school children, in natural history."

CENSUS OF THE PLANTS OF VICTORIA, REVISED EDITION.

In the publication of this edition an attempt has been made to bring the Census up to date as regards additions and omissions, nomenclature and regional distribution. These include: (a) 29 new species, including 12 orchids, described since 1923; (b) 29 species new for Victoria; (c) 5 species recorded on account of the narrowing of species limits; (d) 21 species names removed to different genera, the result of the work of botanists specialising species limits; (d) 21 species names removed to different in certain groups—Chenopodiaceae, Cruciferae, etc.; (e) 7 alterations rendered necessary by the detection of errors in determination; and (f) 48 and changes in species names in conformation with article 48 of the International Rules, 1905.

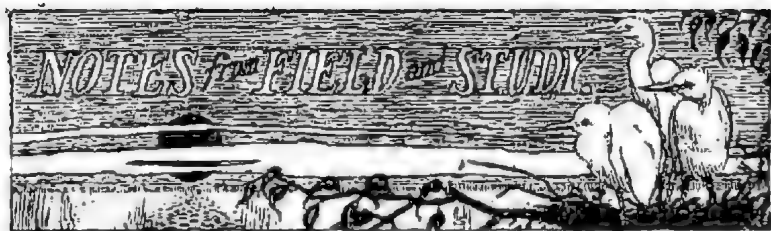
It is intended to publish in December of each year, a Supplement to the Census, copies of which may be obtained from the Hon. Librarian, at a cost of 3d. (if posted, 4d.).

Any member of the Club may, on application to the Librarian, obtain one copy of the Census at the reduced price of 2/6 (interlaced, 3/-).

MOVEMENTS OF MUTTON-BIRDS.

For some time past the Fisheries and Game Department has been marking young Mutton-birds on the Phillip Island rookeries, with a numbered aluminium ring on one leg. In some cases only a number appears on the ring; in others, a year, such as 1925, and the number. During the following Spring, officers of the Department have examined many thousands of birds, coming in to lay on the Phillip Island rookeries, but have never yet succeeded in tracing one of these marked young birds.

Years ago, some of the old birds in the nesting burrows were marked, and these have been recorded as returning year after year to the same locality; but there is no record, so far, of young birds having come back to the rookeries where they were bred. If anybody has an opportunity of examining the Mutton-birds coming in, in the Spring months, on rookeries either on the Australian coast, or among the Tasmanian Islands, the Chief Inspector of Fisheries and Game (Mr. F. Lewis) would be glad if a look out could be kept for birds with rings on their legs. If any are noticed, a record of the particulars on the ring should be taken and furnished to him. Up to the present, we are completely in the dark as to the movements of the young birds.



NET-MAKING CADDIS LARVAE.

A nodding acquaintance with aquatic insect life is better than none at all; but how often one sees objects regarding which he longs to know more than has been recorded. Consider the Caddis Worms. We have many species in our streams, and no detailed biography of one even, so far as my reading goes.

Recently, when hunting for Parnidae (small beetles that lead an aquatic life), I noticed on a piece of tree-trunk, dark and decaying from long submergence, a number of little nets, or snares, each spread from splinters at a slight angle from the perpendicular, and taut as a spiders' orb-web, newly woven. Behind the net, in most cases, lurked a wriggling larva—a Caddis Worm, which seemed to have a "den" of tiny pebbles.

The nets were close together, but not ranged in any order—here was a "city" of Caddis Worms, if the species is gregarious; or else a most favorable position had led to about a score of net-makers forming a group-settlement. Viewed through a pocket-lens, the nets were pretty, while their makers, with snake-like heads, and writhing, pale green bodies, suggested cgres of an elfin world.

My net-makers belong to the Family *Hydropsychidae*, which is represented in Australia by about a dozen species. The larvae are carnivorous, "living," says Dr. Tillyard, "either in fixed houses formed of small pebbles, cemented together with silk and attached to rocks and logs in running water, or, more rarely, constructing a series of conical nets across the surface of a shallow mountain stream, one larva living in the apex of each net, and feeding on the small animals caught in it." (*Insects of Aust. and New Zealand*, p. 382.) The nets I found were not ranged at the surface, nor were they conical, rather they resembled pieces of fairy lace, irregular in shape, and stretched on frames. The meshes were minute, and all of about the same shape and size. Handknitting under a microscope, with the finest silk, might produce such net work.

So we have in our mountain streams, insect larvae that snare their prey, after the manner of orb-weaving spiders. They spin silken threads into fishing nets through which the tiniest fry perhaps could break free quite easily, if entangled. Very small larvae, doubtless, drift into the net, and are captured by the Caddis Worm as they struggle in the meshes.

Aquatic insect architecture has nothing more remarkable to show us, than snares of the net-making Caddis-fly larvae.—C. BARRETT.

MORNINGTON NATURALISTS' CLUB.

Under the leadership of the Rev. Geo. Cox, Mornington Naturalists' Club, continues to make progress, having now nearly 70 members. Recently an amended constitution was adopted, from it the following is quoted:—

"OBJECTS:—To promote a desire to understand and appreciate the beauties and wonders of God's work as seen in Nature. For this purpose excursions are arranged so that various branches of Natural History may be studied under natural conditions, and specimens collected for future use, to build up a collection for exhibition if desired, and to forward specimens to other bodies where such specimens may be of use. Meetings are also held for microscopical study and classification of specimens.

"ORGANISATION:—Members living in Mornington shall form the Mornington Section. Others shall be known as Corresponding Members. Those living in the suburban area shall be grouped in sections as Northern, Eastern, Southern and Western, as members justify such grouping. Those living in the country shall be classed as Country Section, and those in other States as Interstate . . . Each section when formed, may elect its own Group Secretary and Sub-Leader, arrange local excursions, hold meetings, etc., subject to the approval of the Leader."

ANTS IN AMBER.

Recently, Mr. F. E. Wilson obtained a perfect specimen of an ant preserved in amber. It probably is a species of *Polyrachis*, but has not yet been determined. Fossil ants are not so rare; the famous Scudder collection, for example, contains some 7,000 specimens: but the number of genera and species represented, is comparatively small. Professor Wheeler, the great American myrmecologist, after long research, concluded that, generally, the amber fauna (ant) corresponds, fundamentally, to the Asiatic and Australian faunas. This is mentioned by Forel, in his "Social World of the Ants," a very notable work, the English translation of which has just been published.

AUSTRALIAN FRESH-WATER EELS.

One of the most valuable and interesting papers published recently, in any Australian journal, is that by Professor Johs. Schmidt (Director of the Carlsberg Laboratory, Copenhagen), on the Fresh-water Eels of Australia. (*Records Austrln. Museum*, XVI., No. 4). It is a model of what such papers should be, and may be read with equal profit by scientist and layman.

In Victoria, Dr. Schmidt states, *Anguilla australis* is unquestionably the commonest species of eel. It is abundant also in Tasmania, apparently. This is the Short-finned or Unspotted Eel. It "exists along the whole range of the coast, between Richmond River and Sydney; no specimens, however, have been received from intermediate localities." The probabilities are, that the temperate *A. australis*, Rich., has its breeding places in the vicinity of the tropics.

Though some important observations have been recorded, very much remains to be learned regarding the migrations and habits of our fresh-water eels. Four species of *Anguilla* are known from Australia. It is a remarkable fact, Dr. Schmidt observes, that the common New Zealand eel, *Anguilla Aucklandi*, has not been met with either in Australia or on Lord Howe Island.

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THE FIELD NATURALISTS' CLUB OF VICTORIA.

The ordinary monthly meeting of the Club was held in the Royal Society's Hall, Victoria Street, Melbourne, on Monday, May 14th, 1928. The President, Mr. E. E. Pescott, F.L.S., occupied the chair, and there were about 110 members and friends present.

CORRESPONDENCE.

From Mr. William Lawford, Benalla, advising despatch of 12 volumes of Mathew's "Birds of Australia," which he had recently donated to the Club.

From Minister for Lands, stating that, owing to financial stringency, the Government was not in a position to consider the question of purchasing an area of land at Cape Woolamai for a National Park.

From Mr. J. E. Stamp, asking for assistance from members as leaders in connection with nature study outings, for the Brighton Beach Troop of Boy Scouts.

From Mr. Leslie Gray, of Claremont, South Africa, asking that members would exchange seeds and bulbs of Australian plants for those of South African plants.

REPORTS.

Reports of excursions were given as follow:—Diamond Creek, Mr. C. French, Junr.; Botany School, University, Mr. A. E. Keep.

ELECTION OF MEMBERS.

The following were elected as ordinary members:—Miss Helen Bowie, "Lister House," Collins Street, Melbourne; Miss I. M. Fraser, 182 Punt Road, Prahran; Miss Hollow, 62 Wellington Parade, East Melbourne; Miss Jamieson, 15 Lambeth Road, Toorak; Miss F. Mitchell, State School, Spring-road, Malvern; and Mr. D. L. Stirling, 3 Talbot Crescent, Kooyong.

GENERAL.

On behalf of the Committee, the President submitted the following motion, notice of which had been given at the previous meeting, and which was seconded by Mr. L. L. Hodgson:—"That Mr. R. D. Elliott be elected a Life Member of the Club in view of his interest in obtaining a gift of £200 to the Club for special biological field work." The motion was carried unanimously.

Mr. V. H. Miller, formally presented to the Club a handsome cabinet of Queensland Maple, for the safe-keeping of the 12 volumes of Mathew's "Birds of Australia," donated by Mr. William Lawford, and the President, on behalf of the Club, accepted this valuable gift, with expressions of thanks and appreciation, to Mr. Miller. Mr. L. L. Hodgson moved, "That the Committee be requested to have a silver plate affixed to the cabinet with an inscription indicating the donors of both the books and the cabinet." Mr. C. Daley seconded the motion, which was carried unanimously.

The President requested that any member willing to assist in the Boy Scout nature study outings referred to in Mr. Stamp's letter, would kindly notify the Hon. Secretary.

The President referred to a proposal he had received from Mr. A. H. Mattingley, C.M.Z.S., to the effect that members of the Club should assist in the formation of a Natural History Museum at the Melbourne High School. Mr. Mattingley then explained the objects of this proposal, and stated that members could afford considerable assistance by presenting various natural history specimens.

Mr. W. H. Ingram moved: "That this meeting, while warmly approving of the action of the Chief Secretary in appointing an Advisory Council for Victorian Fauna and Flora, is of opinion that the Council as at present constituted is unlikely to ensure public confidence, for the reason that it is not sufficiently representative of National, Scientific and Nature-Loving Associations, such as the Royal Society of Victoria, the Australian Forest League, the Gould League of Bird-Lovers, the Victorian Society for the Protection of Animals, and the National Parks section of the Town Planning Association." After a short discussion, the motion, which was seconded by Mr. G. Coghill, was put to the meeting, and carried without a dissident.

The President drew attention to the fact that the new edition of the "Census of Victorian Plants" was now available.

It was announced by the President that the June meeting would take the form of a *Conversazione*, and he invited members to bring exhibits and give an account thereof.

ELECTION OF AUDITORS.

On the motion of Mr. F. G. A. Barnard, seconded by Mr. G. Coghill, Messrs. W. H. Ingram and A. S. Blake were elected Auditors for the year.

NOMINATION OF OFFICE-BEARERS, 1928-29.

Nominations were received as follow:—President, Mr. F. E. Wilson, F.E.S. (proposed by Mr. A. J. Tadgell, seconded by Mr. C. Barrett); Mr. P. R. H. St. John (Messrs. J. W. Audas and P. F. Morris). Vice-Presidents, Mr. A. E. Keep (Messrs. G. Coghill and A. G. Hooke); Mr. C. Barrett, C.M.Z.S. (Messrs. E. E. Pescott and C. French, Junr.). Hon. Treasurer, Mr. A. G. Hooke (Messrs. A. E. Keep and F. Pitcher). Hon. Librarian, Dr. C. S. Sutton (Messrs. F. G. A. Barnard and A. J. Tadgell). Hon. Editor, Mr. C. Barrett, C.M.Z.S. (Messrs. F. E. Pescott and L. L. Hodgson). Hon. Secretary, Mr. L. L. Hodgson (Miss E. L. Keartland and Mr. H. B. Williamson). Hon. Assistant Secretary and Librarian, Mr. H. B. Williamson (Dr. C. S. Sutton and Mr. E. E. Pescott). Committee, Messrs. G. Coghill, C. Daley, B.A., F.L.S., J. W. Audas and V. H. Miller (proposed by Mr. A. E. Rodda and seconded by Mr. F. Pitcher); Mr. A. E. Rodda (Messrs. A. A. Carter and F. Chapman); Mr. M. J. Woodhouse (Messrs. E. E. Pescott and C. French, Junr.); Mr. R. A. Keble (Messrs. F. Chapman and A. A. Carter); Mr. C. Borch (Messrs. F. E. Wilson and L. L. Hodgson); Miss J. Raff (Messrs. W. Hanks and A. D. Hardy); Rev. W. C. Tippet, F.L.S. (Messrs. L. L. Hodgson and E. E. Pescott); and Mr. J. Clark (Messrs. L. L. Hodgson and H. B. Williamson).

PAPERS, ETC.

The evening was devoted to the reading of papers and reports on the results of the special excursion to the Western District of Victoria in October, 1927. Mr. E. E. Pescott, leader of the expedition, gave a short account of the country traversed and the nature of the work performed, and was followed by Messrs. H. B. Williamson, C. Daley and F. E. Wilson, who dealt with the flora, geology, and insect life respectively of the district, as represented by the specimens collected.

EXHIBITS.

By Mr. F. Pitcher.—Large growths of Ray Water Fern (*Blechnum fluviatile*, R.Br.), from head waters of Bunyip River, near Gilderoy, in April, 1928.

By Miss M. Wigan.—Specimen of Vegetable caterpillar (*Cordyceps*), from Forrest, April, 1928.

By Mr. C. Daley, B.A., F.L.S.—Specimen of Star-hair (*Astrotricha ledifolia*), from Mt. Zero, Grampians, October, 1927.

By Mr. L. L. Hodgson.—Specimen of Red Correa (*Correa rubra*), garden-grown, at Canterbury, from plant obtained at Wilson's Promontory, in December, 1924.

By Mr. F. Keep.—Specimens of Scrub-Cherry (*Eugenia paniculata*), garden-grown, at Canterbury.

By Mr. A. E. Opperman.—Specimens of Flannel Flower, Hakea seed-cases, Banksia seed-cases, Smoke Grass (*Conospermum*), also seeds of Xamia Palm (*Macrorozamia*), from Western Australia.

By Mr. C. Borch.—Case containing butterflies, with largest wing spread of Australian species (*Trimides priamus*), and with smallest wing spread (*Chilades putli*), both from Queensland.

By Mr. A. D. Hardy.—Fruiting twigs, buds, bark, juvenile foliage, seedling plant, and photographs of Spotted Gum, *Eucalyptus maculata*, Hook. Collected by the exhibitor at Bete Bolong, Tara Range, S.E. of Buchan, in May, 1928.

By H. B. Williamson, F.L.S.—Fruit specimens of *Eucalyptus maculata*, Hk., collected near Mr. Fred Broome's home on the Cann River, in January, 1920, by the exhibitor, and a photograph taken by him of one of the trees. Bud specimens from the same trees, collected by Master Erle Broome, in May, 1928. Three books of dried specimens of native plants collected in East Gippsland, by Miss Alice Birch. Dried specimens of nine species of the Family *Liliaceae*, illustrating *The Lilies of Victoria, Part I*. Dried specimen of *Pultenaea patellifolia*, H.B.W., Mt. Byron Bush-pea, a species new to science, described by the exhibitor in his *Revision of the Genus, Pultenaea, Part V.*, read before the Royal Society of Victoria, in December, 1927; collected by J. W. Audas and the exhibitor at Mt. Byron, where it was first discovered by Mr. Harold Smith, of Horsham, in October, 1927.

THE LILIES OF VICTORIA.

BY H. B. WILLIAMSON, F.L.S.

Part II.

Genus LOMANDRA.

Greek, *loma*, margin; *andros*, male, referring to margin of the anthers in some species.

Labillardiere, in 1804, described the genus *Lomandra* with two species, *L. longifolia* and *L. rigida*. In 1810, Robt. Brown used the name *Xerotes* for a genus of plants which had been previously described by Labillardiere, including the two species above named. In Proc. Roy. Soc., Victoria, Vol. 28, the use of the prior name was correctly reverted to by Professor Ewart.

This genus, under the name *Xerotes*, is included in N.O. *Juncaceae*, in Bentham's Flora, but we now follow Engler in keeping it with Fam. *Liliaceae*.

CHARACTERS OF THE GENUS:—Plants with narrow, hard, linear leaves, with their sheathing bases often split into silky filaments. Flowers small, male and female on separate plants.

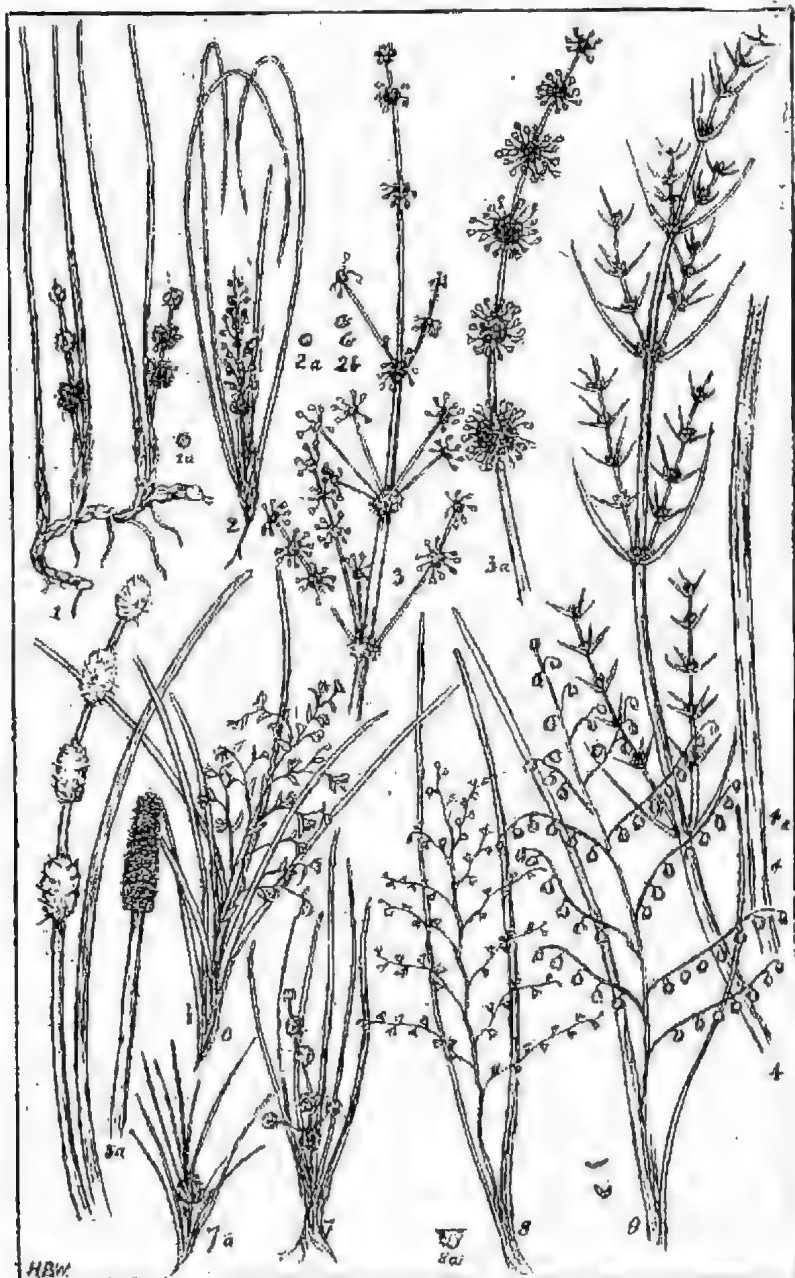
KEY TO THE SPECIES.

1. Leaves quite round, rush-like 2
- Leaves flattened or angled 3
2. Growing from a scaly rhizome, flowers, in dense globular heads *L. juncea*
- Tufted, flowers in small irregular clusters, sometimes paniced *L. sororii*
3. Flowers in whorls or clusters 4
- Flowers in loose panicles 7
4. Staminate flowers in simple whorls *L. multiflora*
- Staminate flowers in clusters 5
5. Clusters in whorled panicles *L. longifolia*
- Clusters in spikes or heads 6
6. Clusters large, woolly, globular or cylindrical *L. leucocephala*
- Clusters small, yellow *L. glauca*
7. Flowers large, scented *L. effusa*
- Flowers very small 8
8. Flowers dark-coloured, petals spreading, leaves semi-terete, grooved *L. micrantha*
- Flowers yellow, globular, leaves flat *L. filiformis*

LOMANDRA JUNCEA (F. v. M.) Ewart. Desert Mat-rush.

Fig. 1.

Leaves, or barren stems as some botanists consider them, rising from a very scaly rhizome to a foot in height, terete, pungent, surrounded at the base with whitish, pointed, imbricate scales about an inch long.



1, *Lomandra juncea*. 2, *L. sororia*. 3, 3a, *L. multiflora*. 4, *L. longifolia*. 5, *L. leucoccephala*. 6, *L. effusa*. 7, *L. glauca*. 8, *L. micrantha*. 9, *L. filiformis*.

Flowers on a scape 3 to 6 inches in length, with a terminal head 3 or 4 lines in diameter, and two or three others lower down, embracing the scape. Recorded from the North-west of the State, Dimboola, and along the S.A. border. Also in S.A.

LOMANDRA SORORIA (F. v. M.) Ewart. Small Mat-rush.
Fig 2.

A plant resembling the preceding, but with shorter and thinner leaves, and apparently no rhizome. The flowers are in clusters of a few flowers on small panicles, very shortly stalked, erect, sometimes reduced to a single spike. The female plant has not yet been collected. It is recorded for N.W. and S.W. of the State, and also for all States except Tas. and W.A. Some confusion exists with regard to this species. Under this name are included specimens (a) from Lillimur, and the Grampians, with terete leaves, and labelled "var. *teres*"; and a specimen (b) from Mt. McIvor, C. Stuart, with leaves very narrow and folded, section Fig. 2b, placed in Mueller's Frag. VIII., 208, as *X. filiformis*, R.Br., of which it may be a narrow-leaved form.

The former (a) was also collected at Hill Top, N.S.W., in 1913, by Mr. Cheel, and is labelled "*Xerotes teres*, E. Cheel, n.sp.", but I have not been able to ascertain whether it has been described.

LOMANDRA MULTIFLORA (R.Br.) Britten (*X. Brownii*, F. v. M.). Many-flowered Mat-rush. Fig. 3.

Leaves 6 inches to a foot long, and about 2 lines broad. Scape slightly flattened. Flowers in clusters on a whorled panicle from a few inches to a foot long, in small forms the panicle reduced almost to a spike (3a), but easily distinguished by its stalked male flowers. Female flowers are sessile and longer than the males. All districts of Victoria, and in S.A., N.S.W., and Q.

LOMANDRA LONGIFOLIA, Labill. Long Mat-rush. Fig. 4.

A tufted, rigid plant, with leaves 1 to 2 feet in length and 2 to 3 lines broad, mostly 2-toothed at the apex (4a). Scape from under 1 foot to nearly 2 feet in height, including the inflorescence, below which it is much flattened. Flowers very small, sessile and numerous in dense clusters, having long, pointed bracts, sometimes far exceeding the flowers, a character by which the species may readily be picked out. No other of our species grows so large or covers such large areas. At Moonlight Head, near the Gellibrand River, the writer passed through

many acres of this plant, interspersed with innumerable flowers of *Burchardia umbellata*, which latter strongly asserted itself by its sweet scent. It has been recorded in all districts of Victoria, except the North-west, and in all States but W.A.

LOMANDRA LEUCOCEPHALA (R.Br.) Ewart. White Mat-rush. Fig. 5.

A tufted plant, with radical leaves 1 to 2 feet long, and scarcely more than a line broad, with scarious margins at the base, and split into long, fine filaments. It is easily known by its dense, globular or ovoid heads of male flowers about $\frac{3}{4}$ inch in diameter, 3 or 4 on a scape. As the bracts between the flowers are split into numerous crisped filaments, a woolly appearance is given to the heads from which a few long, pointed, straw-like bracts protrude. Female flowers are on a single dense cylindrical spike (5a). Sandy tracts in the North-west, and in the Northern Grampians. Occurs in all other States but Tasmania.

LOMANDRA EFFUSA (Lindl.) Ewart. Scented Mat-rush. Fig. 6.

Leaves densely tufted, about a line in breadth, with rather long, sheathing bases, the margins of which are split into filaments. Inflorescence a loose panicle 2 to 4 inches in length. Male flowers are on slender pedicels, solitary, or rarely with a second almost sessile flower in the same bract. The bracts are very prominent, ovate or lanceolate, and very thin. The flowers are fragrant, and larger than those of any of the other species. Female flowers are sessile or nearly so. Distribution in Victoria the same as that of the preceding species. Found in all States but Tasmania.

LOMANDRA GLAUCA (R.Br.) Ewart. Pale Mat-rush. Fig. 7.

A low, tufted species, with narrow-linear leaves, sometimes glaucous, usually about 3 inches in length, but sometimes twice that length, straight or slightly twisted, with their sheathing bases more or less split into filaments. Male inflorescence simple, or shortly branched. Flowers small, in globular clusters along the rhachis. Perianth under a line in length, pale, almost globular. Female heads much larger (7a) almost sessile among the upper leaves. All districts but the N.E. All States but Queensland.

LOMANDRA MICRANTHA (Endl.) Ewart. Small-flowered
Mat-rush. Fig. 8.

Leaves semi-terete (8a), upper side flat and smooth, underside grooved, 6 inches to a foot in length. It differs from *L. effusa* in its very small flowers and bracts. Perianth segments very spreading, about 1 line in length, dark-coloured when dry. Female inflorescence much less branched, often quite simple, with flowers rather larger than the males. It has been recorded from Dimboola, Moyston, Goulburn Weir, and Stawell, and from all States but Tas. and Q.

Var. *sororia*, F. v. M. "Leaves above a foot long, flat, at least 2 lines broad. Panicles spreading, 6 to 10 inches long. Mt. Wellington, Gippsland, F. Mueller. Perhaps a distinct species." *Fl. Aust.*, p. 103.

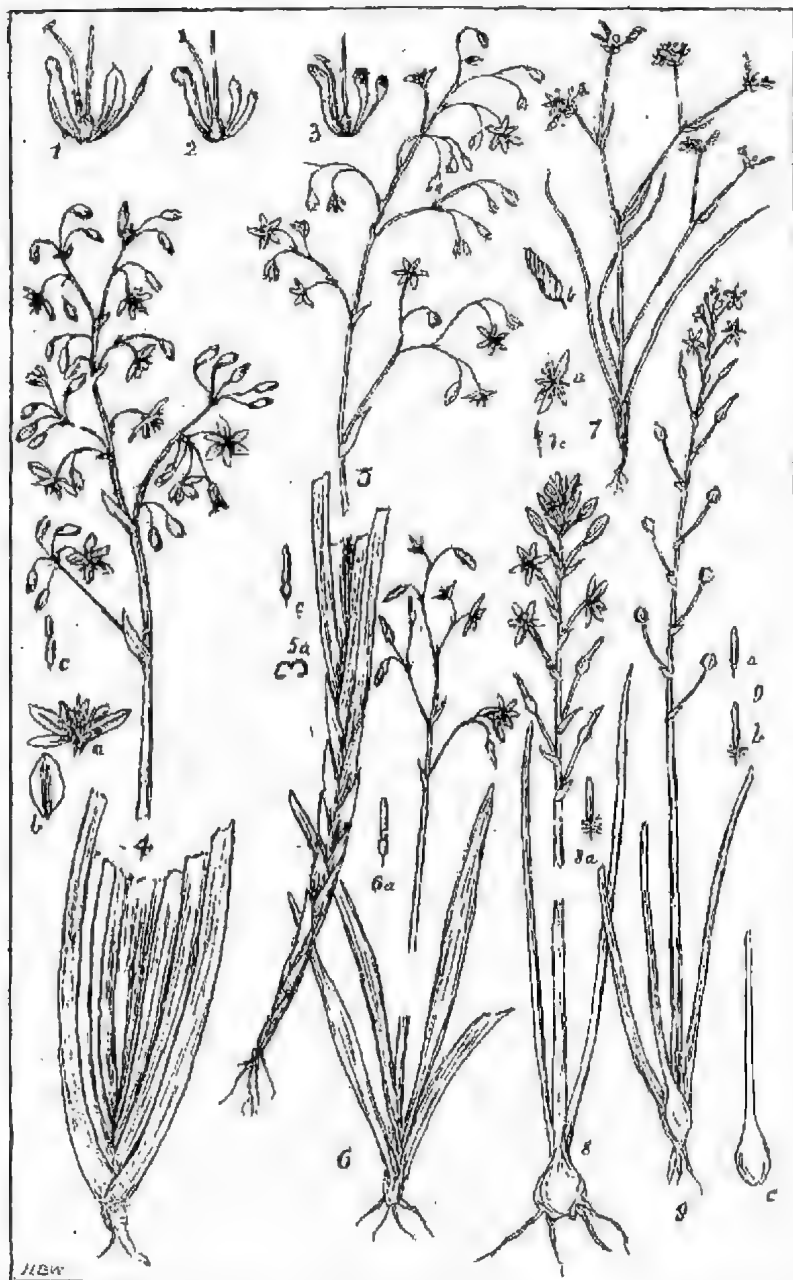
LOMANDRA FILIFORMIS (Thunb.) Britten. (*X. Thunbergii*, F. v. M.). Wattle Mat-rush. Fig. 9.

A more common plant than the last two species, resembling them both in the loose panicle of scattered, not clustered flowers. The leaves are 1-2 lines, or even more in breadth, and sometimes $1\frac{1}{2}$ to 2 feet long. Flowers are bright yellow, almost globular, about $1\frac{1}{2}$ lines in diameter, with rather fleshy petals, never spreading, on recurved pedicels, with minute bracts below the pedicels. Found in all districts and in all States but W.A. and Tas.

Genus, *XANTHORRHOEA*.

Greek, *Xanthos*, yellow; *rheo*, to flow; referring to the resin in the stem.

This genus, which is confined to Australia, was, like *Lomandra*, included under *Juncaceae* in Bentham's *Flora*, but is now accepted as a member of the Family *Liliaceae*. These "noble liliaceous plants," as Mueller referred to them, give to the landscape in many parts of Australia the "peculiar floral physiognomy" of the "Grasstree" country. They are slow-growing, long-lived plants, and although their stems and leaves contain much inflammable matter, bush fires serve only to stimulate them, instead of exterminating them. They produce shapely tufts of hard, linear leaves, the bases of which are sometimes broad and thick, and after the leaves break off, form in some species black stems several feet in height, and a foot thick, hence the name, "Blackboy" applied to them in West Australia. One of the largest, *X. Tatei*, growing in Kangaroo Island, has been a prolific source of a fragrant resin, "Grasstree gum," which has been in de-



1 to 3, *Xanthorrhoea*. 4 to 6, *Dianella*. 7, *Tricoryne*. 8, 9, *Bulbine*.

mand for particular sorts of varnishes, colouring for limewash for walls, and the manufacture of sealing wax and picric acid. This last-named chemical was used in making high explosives, used in the War. Two of our species, *X. australis* and *X. hastilis*, have also been drawn upon for these uses.

XANTHORRHOEA AUSTRALIS, R.Br. Austral Grass-tree.
Fig. 1.

Leaves in tufts, about 2 feet in length, their persistent bases broad, forming a trunk often several feet in height, and sometimes branched. In this trunk a dark resin is exuded which can be extracted by the process of destructive distillation. The flower scape is stout, 2 or 3 feet in height, and surmounted by a flower spike several times as long as the scape. Some specimens have been seen, e.g., at Mount Martha, which attained the height of 12 feet. Flowers are densely crowded among dark brown, acuminate, glabrous bracts. Sepals are hard, pointed, glabrous. Petals hardly longer, but thinner, whitish upwards. Anthers versatile; filaments rather thick, white, about half exserted. It is found in all parts of Victoria and in S.A. and Tas.

In Figs. 1, 2 and 3, from left to right, an inner perianth segment (petal); a stamen; pistil; an outer perianth segment (sepal); a bract.

XANTHORRHOEA MINOR, R.Br. Small Grass-tree. Fig. 2.

This is distinguished from the preceding by its dwarf habit, and slender scape with short flower-spikes, rarely more than 9 inches in length, the total height rarely exceeding 4 feet. A trunk is never developed on the short caudex, from which usually several scapes arise. The petals have white, obovate, spreading laminae, exceeding the sepals, which are quite glabrous, or somewhat ciliate towards the end. The bracts are spatulate and shortly acuminate. It occurs in all parts of Victoria except the North-East, and in all States but W.A. and Qld.

XANTHORRHOEA HASTILIS, R.Br. Spear Grass-tree.
Fig. 3.

This plant bears a tall flower-spike up to 10 feet in height, the scape below the spike being from 6 to 8 feet. It is easily distinguished from the last two by the dense, rusty tomentum covering the ends of the bracts and outer perianth segments, and by the short stamens, scarcely exceeding the perianth. The capsules protrude

further from the fruiting spike than in *X. australis*, and the resin secreted from the very short caudex is yellow instead of dark red. It appears to be confined to the extreme east of the State. The writer collected it near the west side of Mallacoota Inlet. Its record for the S.W. has apparently been made in error. It occurs also in N.S.W. and Qld.

Genus DIANELLA.

From the diminutive of Diana, goddess of hunting.

Sepals and petals blue, 4 to 5-veined, filaments swollen near the anther, fruit a bluish berry. Perennials with rigid stems, and basal leaves in two rows with long sheaths.

DIANELLA TASMANICA, Hk.f. Tasman Flax-lily. Fig. 4.

Plant with stems to 2 feet in height, leaves distichous, crowded at the base of the stem, usually 1 to 2 feet long and $\frac{1}{2}$ to nearly an inch broad, with scabrous (minutely toothed) margins and midrib. Flowers on recurved pedicels, in a panicle rising to over a foot in height. Sepals and petals deep blue, 5-veined, about $\frac{3}{4}$ inch in length (4b). Anthers yellow, hardly as long as the large, thickened orange-coloured portion of the filament (4c). Fruit a blue berry about $\frac{1}{2}$ inch long. Common in the hilly country in the South, East, and North East of the State; also found in N.S.W. and Tas.

DIANELLA REVOLUTA, R.Br. Spreading Flax-lily. Fig. 5.

A similar but much more common plant than the preceding, distinguished from it by leaves less scabrous at the edges, or even quite smooth, and usually much more revolute over the midrib, leaving a deep furrow on the upper side (5a). Its anthers are dark-coloured and considerably longer than the filaments, of which the thickened apex is usually very short (5c). Berries are similar but smaller. It has been found in all districts of the State and in all States.

DIANELLA LAEVIS, R.Br. (*D. longifolia*, R.Br.). Smooth Flax-lily. Fig. 6.

Usually about a foot in height, easily distinguished from the preceding by its flat, scarcely recurved leaves, which have their bases scarcely keeled, and by its pale or yellowish anthers (6a).

It is found in all districts of Victoria and in all States but W.A.

Genus TRICORYNE.

From the Greek, referring to the three-clubbed fruit, TRICORYNE ELATIOR, R.Br. Yellow Autumn Lily. Fig. 7.

Stems branched and wiry, and leaves few and grass-like. Flowers yellow, or partly reddish, in terminal umbels of 3 or 4 flowers with small imbricate scarious bracts, of which one or two outer empty ones are often elongated and pointed. Sepals and petals spirally twisted over the ovary after flowering (7b). Filaments very thin, with a dense, woolly tuft under the anther (7c). It flowers nearly all the year round, and is very common in all parts of the State. It also occurs all other States.

Genus BULBINE.

BULBINE BULBOSA (R.Br.) Haw. Bulbine Lily. Fig. 8.

Usually about a foot in height. Roots in old plant forming a bulb-shaped tuber immediately below the stock, but not really bulbous. Leaves all radical, linear, pointed, rather thick, grooved in front, with short sheathing bases. Flowers yellow, in racemes which may extend for several inches, with scarious bracts under the erect pedicels. Although the racemes bear many flowers, seldom more than two or three are open at a time. Sepals and petals very thin, about $\frac{1}{2}$ inch long, with a narrow, dark, obscurely 3-nerved centre. Filaments all with a tuft of hairs sometimes very short, just under the anther, or somewhat below it (8a). One of our most common spring flowers, found in all parts of the State, and in all States but W.A.

BULBINE SEMIBARBATA (R.Br.) Haw. Leek Lily. Fig. 9.

Much resembling the preceding, but with roots fibrous without any tuber under the stock. Leaves have broad membranous bases (9c). The racemes are looser, with fewer flowers, and 3 of the filaments are short, without beards (9a), while the other 3 are longer, and are bearded as in *B. bulbosa* (9b). The sea-coast form, e.g., Doughboy Island, Corner Inlet, has very succulent stems and leaves, which grow to nearly 2 feet in height. It occurs in all parts of our State and in all other States.

NOTABLE NATURALISTS.

I.—JOHN GOULD.

Not only in Australia, but wherever ornithology is studied, John Gould's fame is secure. Though not the greatest among naturalists who have worked long in our country, or visited it as gleaners here and there, Gould's name is more widely known in the Commonwealth than that of Darwin even. The Gould League of Bird Lovers has a host of members, girls and boys, who honour the memory of the "Bird Man" and father of Australian ornithology.

Gould remains first among ornithologists, who have dealt with Australian birds. He was both scientific and popular in his writings; and his great pictorial works have never been surpassed, either in beauty or interest. Always *The Birds of Australia*, folio volumes, and the *Handbook*, will be valued, as they deserve to be. Their author was a keen observer, a lover of birds in Nature, as well as a competent "museum man." Fortunately, his work was done before the burden of sub-species had to be borne by naturalists. Another generation of students, doubtless, will demolish the rambling, insubstantial edifice which modern "splitters" have erected at such pains. But Gould built on a firmer basis, his mistakes are comparatively few.

It is proposed, this year, to commemorate Gould's arrival in Australia—in May, 1838. Relics of the Bird Man may be shown, including the photograph here reproduced, for the loan of which I am indebted to Mr. E. A. Vidler, of Melbourne. In Australia, probably, no other copy of it exists. The book, shown leaning against a table, is a volume of one of Gould's works.

Mr. Vidler's mother, a daughter of Dr. George Bennett, was Gould's only grandchild—her maiden name was Amelia Gould Bennett. Gould and the learned doctor were great friends, and the former owed some of his knowledge of Australian birds, and many specimens probably, to the author of *Gatherings of a Naturalist in Australasia*, and *Wanderings in New South Wales, Singapore, and China*.

It is strange that we have no full length biography of John Gould. The lives of many lesser men have been told, in portly volumes. Dr. R. Bowdler Sharp's "Biographical Memoir," in his *Analytical Index* to Gould's works, makes excellent reading, but is too brief—

CHARLES BARRETT.

Plates 1 and 2, within this issue, belong to the May number, from which, through an oversight, they were omitted by the printers.



John Gould.

GREENHOOD ORCHIDS (*PTEROSTYLIS*), IN
ABNORMAL SEASONS.

BY W. H. NICHOLLS.

Until quite recently, it was generally supposed, that the leaves of all species of plants would naturally always accord with the type form. Recent research, however, shows that many of the species can exhibit a bewildering variety.

In the flowers, also, we must expect to find great variation in size and colouring. Botanists attach little importance to colour generally. Flowers, if normally of a pale green, with darker green striae and other markings, might range from glassy white to almost purple. So it is with size. Some flowers may be met with, nearly double the size of those type specimens; others, barely half that size.

These variations were always to be expected; the conditions controlling such modifications of size and colour, being mostly seasonal. Persistence of wet or dry weather, during the months of development, is a very large factor indeed. Then, of course, soil and situation, must always be reckoned also, and it is now recognised that cross-fertilisation is responsible for much diversity of form and colour. (See Lotsy—"Evolution Considered in the Light of Hybridisation.")

From brush and camera records made in recent years, a few instances may be cited.

Pt. obtusa, R. Brown. This greenhood is widely distributed, occurring in all the States, with the present exception of Western Australia and Northern Territory. Still, it cannot be regarded as a very common species. It favours, chiefly, rocky, timbered slopes, in many of our mountain ranges; usually in those situations, under Eucalypts, which are also favoured by *Pt. longifolia*, Br., *Acianthus exsertus*, Br., *Corysanthes dilatata*, R. and N., and *Corysanthes diemenica*, Lindl.

The flower varies, but slightly, morphologically, in different localities, chiefly in minor details. See Figures 6, 7, 8. COLOUR: Specimens from the Mt. Macedon district, were all very darkly coloured, while others, sent from the Paterson District (N.S.W.), were wholly green. Our Dandenong Range (F.T.G.), and Hume Vale plants show flowers of intermediate colouring, inclining rather to the green.

Pt. obtusa, usually is a single-flowered plant, but, when two favourable seasons follow one another, plants with two perfect flowers, or, with one perfect, and one rudimentary, may frequently be met with; which suggests that a superabundance of food has been stored in the new tuber.

LEAVES: The stem-leaves of *Pt. obtusa*, are invariably lance-shaped. It was most interesting to collect, two years ago, at Mt. Macedon, a specimen with perfectly oval stem-leaves. (Fig. 1.) This is now in the National Herbarium. Fig. 2 depicts a plant bearing a rudimentary bud, which, owing to exceptionally dry weather, the plant had been unable to mature; later this same plant, under the influence of unseasonable warm rains, had devoted its energies to the production of the large, succulent and highly-glazed leaves (shown in the figure) in place of putting forth a flower. Fig. 3 shows a plant, in which, owing to abnormal rainfall, leaves larger than normal, and a much elongated stalk, have been produced.

Fig. 4 shows a startling freak. No well-behaved Greenhood should have more than a single stem. Yet here is a plant with two stems, carrying leaves of all types—stem, basal and intermediate! Further, the crowning leaf of the main stem is also highly glazed. In Fig. 5 is seen another example of the stem continuing to grow, after the nipping in the bud, of its own flower, and the production of leaves of both types, the apical one being a large one of the intermediate form, but glazed, as if, having failed to produce its flower at the right time. The plant had determined to give this monstrous leaf the glassy appearance that is one of the charms of most Greenhood Flowers. Figs. 6, 7 and 8, show variations in the form of the lower lip, and in the length and character of the three sepals.

Apparently leaf abnormalities may be looked for in any very unusual season, in any, or all, of the Greenhoods which normally show only stem-leaves at flowering time. They seem always to be plentiful in the habitats of *Pt. truncata*, Fitzg.; in all stages of development, typifying the variable conditions under which this remarkable species grows. (Fig. 15. See also *Vic. Nat.*, Vol. XLIII., Aug., 1926, Fig. 22a.)

My records of *Pt. truncata*, furnish further evidence of these modified leaf formations. On the You Yangs Range, in April, 1925, several specimens collected had large, ovate-lanceolate stem-leaves (Fig. 9), in lieu of the normal lance-shaped leaves. Unlike some of the



Greenhood Orchids, Showing Variations.

specimens of *Pt. obtusa*, Figured, where sap intended for flower formation seemed to have been diverted into channels productive of strangely shaped leaves of unusual size, these favoured specimens had exceptionally fine flowers also. There was no difficulty in accounting for this, the very highest degree of development looked for in Greenhoods. The plants were growing in a hollow, where every drop of rain water would give best results. The ground between rock-masses was rich in humus, and, the season had been ideal.

Figs. 10, 11, 12 and 14, show individual specimens of other species with abnormal leaf development.

To see how far *Pterostylis* would respond to cultivation, I transplanted, while they were still in the early stages of bud development, plants of *Pt. grandiflora*, R.Br., and *Pt. revoluta*, R.Br. These went into pots containing, in addition to the original soil, dug up with the tubers, rich loam from the hills, well-rotted leaf mould, and some liquid fertiliser (cow-manure). Placed where the light approximated to natural conditions, and well-watered, there should have been good results—and there were. Each plant produced stem-leaves, much finer than normal, while the *Pt. revoluta* plant grew an unusually fine flower, equal in size to the finest collected in moist places in Gippsland, Fig. 12. The flower of *Pt. grandiflora*, which was of the usual size, was most richly coloured, and its petals assumed the dilated form that I had previously met with only in flowers from New South Wales (see Fig. 13).

The instances given are, it will be understood, far from common; and the majority are to be regarded as products of abnormal atmospheric conditions. No statements of this nature, so far as I know, have hitherto been placed on record.

GREENHOOD ORCHIDS.

Key to the Figures (all reduced to approximately $\frac{1}{2}$ nat. size),
Page 45.

- Fig. 1—*Pt. obtusa*, R.Br., with oval stem-leaves. Mt. Macedon, April, 1925. D. Matthews.
Figs. 2, 3, 4, 5—*Pt. obtusa*, plants with abnormal leaves, etc. Mt. Charlie, April, 1928. W.H.N.
Fig. 6—*Pt. obtusa*, flower (wholly green), with protruding lip and long sepals. Paterson (N.S.W.), April, 1920. Rev. H. M. R. Rupp.
Fig. 7—*Pt. obtusa*, flower. Mt. Macedon, Mar., 1928. D. Matthews.
Fig. 8—*Pt. obtusa*, flower, sepals finely pointed. F.T.G., Dandenong Range, April, 1925.
Fig. 9—*Pt. truncata*, Fitzg., abnormal leaves, You Yangs, April, 1925.

- Fig. 10—*Pt. robusta*, Rogers, abnormal leaves. Nat. Park, S.A., Aug., 1926, Dr. R. S. Rogers.
 Fig. 11—*Pt.* — — (an undescribed species), a specimen with abnormal stem-leaves. Barrington Tops, N.S.W., Jan., 1925. C. Barrett.
 Fig. 12—*Pt. revoluta*, R.Br., Large flower and stem leaves (this specimen had 5), normally this species is almost leafless (*cultivated specimen*).
 Fig. 13—*Pt. grandiflora*, R.Br., flower with broad petals and large stem-leaves (*cultivated specimen*).
 Fig. 14—*Pt. alata*, Reichb., with abnormal stem leaves. Cheltenham, July, 1927. A. B. Braine.
 Fig. 15—Abnormal radical leaves of *Pt. truncata*. The second plant shows the typical form. You Yangs, April, 1924.
 Note:—The majority of the original specimens illustrated are now in the author's herbarium.

EXCURSION TO BIOLOGY SCHOOL.

Some 20 members and friends attended the Biology School at the University on Saturday afternoon, May 5. Professor W. E. Agar received the party, and delivered an interesting address dealing with certain aspects of the Darwinian and later theories of evolution in regard to the influence of heredity and environment.

The party then proceeded to the Laboratories, where Professor Agar had arranged a number of exhibits illustrating the progression and retrogression of types in the course of evolution through the ages. One series showed the evolution of the five-toed foot of the ancient horse to the hooved foot of the present day animal. Another series illustrated the evolution of flight from the Pterodactyle to the Eagle, and thence retrogression to the flightless birds, such as the Emu, with its rudimentary wings. A further example of retrogression was depicted in a series of lizards, ranging from the fully developed four-legged type, through the intermediate forms with rudimentary legs, down to the legless lizard, which is distinguished from snakes by having earholes and a long tail with the alimentary vent well forward, while snakes have no visible earholes and a comparatively short tail with the alimentary vent much farther back.

A vote of thanks was accorded Professor Agar for the excellent arrangements which he had made for the reception of the party, and also for his address, which was much appreciated.—
J. L. HODGSON.

EXCURSION TO DIAMOND CREEK.

The excursion to Diamond Creek, on April 21, was well attended, 30 members taking part. The locality chosen was some thick Eucalyptus scrub, near Tanek's Corner. A number of forest insects, including gall-making coccids, lerps, froghoppers, timberborers and other forms were noticed, and a few remarks on each were made by the leader. Several orchids were exceedingly plentiful, namely, *Pterostylis parviflora*, "Tiny Greenhood," and *Eriochilus cucullatus*, "Parson's Bands." A fine Greenhood with a large flower was found; this probably is a new species, and has been forwarded to Dr. Rogers, of South Australia, for examination.—C.F.

THE WEDGE-TAILED EAGLE.

BY (MRS.) V. H. MILLER.

The Wedge-tailed Eagle, although one of the largest eagles in the world, is commonly called "Eaglehawk" by Australians. The exact measurement of the largest specimen shot in Victoria, at the Werribee Gorge, is still disputed. An extreme wing span was attributed to this particular specimen, but recent reports maintain that the bird had been dead for several days when measured, and therefore the figures recorded cannot be relied upon.

Probably there are few other purely Australian birds that are held in such wide-spread disfavour as our glorious Wedge-tail. Wherever one goes, the same stories are told—particularly by those interested in sheep-breeding—of the terrible depredations by eagles. Recently, at a meeting of the Club, we were shown a photograph of a large Wedge-tailed Eagle lashed to a wire fence, evidently as a horrible warning to other eagles of their impending fate. Nor do some of our museums minimise the slander—for slander it mostly is. In the Bird Section of the Perth (W.A.) Museum, a Wedge-tailed Eagle is suspended from the roof, holding in its talons a young wallaby.

At Dookie Agricultural College, in the spring of 1927, I attempted to get one authentic story of an eagle destroying, or carrying away, a newborn lamb. But, although several farmers' wives declared that "of course" eagles pick out lambs' eyes, and eat their tails," none of the accusers had actually seen it done. I did not increase my popularity by suggesting that "of course" the tails are removed in any case. I was informed that at one time eagles nested there, but as there are no restrictions on shooting birds, one must go further afield to find a nest. Surely it is time that some steps were taken to make the farmers of to-morrow a little more familiar with the true character of that useful, and majestic bird, the Wedge-tail.

In trying to account for the beginning of all this feeling against eagles, one finds that early writers had some rather tall stories of the daring feats supposed to have been accomplished by the eagles of the Northern Hemisphere. Indeed, an old law in the Orkney Islands provided a bonus for every eagle accounted for.

It does seem as though the early settlers "imported" a rather unenviable reputation for the Australian Eagle. Probably they thought themselves perfectly justified in

attributing the same rapacious characteristics to a bird so nearly resembling the ones they knew in the Old World. The same nesting habits of choosing the highest tree, or most inaccessible crag, and of using the same nest year after year, merely adding a little to the old one, until the whole assumes a prodigious size. The same majestic soaring, was noted. Who has not admired (even begrudgingly) the apparently effortless flight—the seeming disdain to attack smaller birds, who have at times been found actually nesting in close proximity to this Lion of the Bird World.



The Wedgetail.

[Photo, by Chas. Barrett.

The eagle rarely lays more than two eggs. Some observers maintain that, in times of food scarcity, the female (which is larger than the male), has been known to sacrifice one of her fledglings, that the remaining young one might be adequately provided for.

Although the eagle is not looked upon with favour by the layman, in some religious circles it certainly holds pride of place. A favourite design for a Church reading-

desk is an eagle, with the Bible resting on the out-spread wings. Such a desk it was my privilege to see at very close quarters, carved from a solid piece of dark oak—a prize piece of ecclesiastic furniture. It is a correct symbol of the ancient idea of sending the Bible to the uttermost ends of the earth—and the eagle is chosen because it is the strongest bird, and able to fly the highest. One would naturally suppose that the earlier churchmen must have had some still older traditions (?) from which the present-day “symbols” originated. Therefore, it is not surprising to find that the eagle is mentioned more often in the Bible (principally in the Old Testament), than any other bird—viz., 14 times. In 12 instances reference is made to the flight and might of the eagle; so whatever changes other birds may have undergone in the process of evolution, it seems that the eagle, for centuries has had the same magnificent attributes. The earliest references is in the time of Moses, when the eagle was forbidden as an article of food.

The eagle seems to have entered more widely into story than song. I can recall only one instance in which a song-lover plights his troth declaring that when the eagle forgets her young, and the sun fails to efface the dew, then and only then will he be found faithless. One may question the eagle’s affection for her young when they no longer require her care. Still, if the lady knew little of ornithology, and, like the Psalmist, little of the ways of eagles, she may have felt quite content with her lover’s protestations of fidelity.

FIVE GENERA OF BIRDS IN ONE TREE.

On May 11, 1928, after a light fall of rain, I entered a small paddock, at Bendigo, which was heavily timbered with Ironbark *Eucalyptus sideroxylon*, in flower. At first there were very few birds to be seen, but after a while I espied about 20 in one small tree. All did not belong to the same genus. A male Scarlet Robin, *Petroica multicolor*, was, naturally, the first to catch my eye. He was very quiet, sitting most of the time on a branch, and only occasionally flying to the ground for an insect. As a contrast, a Grey Fantail, *Rhipidura flabellifera*, was for ever on the move, darting to and from the tree. One female and two male Orange-winged Sittellas, *Neositta chrysoptera*, were working spirally up and down the trunk and branches. Several Brown Weebills, *Smicrorhynchus brevirostris*, and Yellow-tailed Thornbills, *Acanthiza chrysorrhoa*, were hunting for insects, sometimes in the tree and then on the ground. There was no quarrelling. Each genus had its own part of the tree, or the ground, or the air surrounding, to itself. When one flew to another tree, they all followed. This happened three times, until, I think, they became aware that I was stalking them, and so separated.—M. COHN.

KANGAROOS IN VICTORIA.

BY F. LEWIS, Chief Inspector of Fisheries and Game.

Kangaroos have been protected in Victoria for very many years. About twenty years ago, on the formation of a separate Fisheries and Game Department, the regulations were considerably tightened up, with the result that the professional kangaroo hunter gradually dropped out of the business, because he could not get a sale for skins.

The disappearance of the professional hunter has resulted in a considerable increase in the number of kangaroos in Victoria during recent years, and many complaints are received from landholders regarding the depredations of these animals on their crops and grass, and damage to the fences, in the winter months. The problem has been further complicated by the increasing number of rabbits in the bush country. Twenty years ago many of these forest areas had no rabbits in them, consequently, the kangaroo had quite a fair amount of rough feed, and he did not go out on to the settlers' properties, except in very dry seasons, or in the depth of winter, when grass would be scarce in the bush.

Now that the rabbit is so plentiful in the bush, and takes the best of the grass, the kangaroos are forced out in larger numbers, and earlier in the season, on to the settled country. A recent investigation in southern Gippsland, in the areas between Rosedale, Yarram and Sale, goes to show that, in this rough country, there must be a very large number of kangaroos, and that the numbers have certainly increased very considerably in recent years.

The fear has been expressed, in some quarters, that it is only a matter of time when the kangaroo and other native animals will be exterminated in Australia; but, so far as Victoria is concerned, the elimination of the professional hunter, and the tightening up of the regulations, has resulted in, not a decrease, but an increase in the number of native animals, compared with, say, ten years ago. The platypus, for instance, is exceedingly common in practically all of our streams, as is proved by the numbers we meet with when conducting netting operations for trout and other fishes. It is not often seen by the general public, because it comes out only in the dusk of the evening. Rigid protection of these animals, and absolute prohibition of the possession of skins, has certainly resulted in their increase; and the same may be said of many other members of our native fauna.

A TRUE MOULT, IMMEDIATELY AFTER HATCHING, IN THE *CICADA*.

BY JANET W. RAFF, M.Sc., F.E.S.

During last year I had the opportunity of observing the later stages of the hatching process of the Cicada, *Psaltoda moerens*, and a few notes made at the time were recorded in the *Victorian Naturalist* (Vol. 44, p. 200). It was stated there, that the whitish skins cast in the final act of hatching, and left sticking to the bark of the twig, appeared to be a true "molt" or cast larval cuticle, and not an embryonic membrane such as the

amnion. On further examination, this proved to be the case, showing that the Cicada exhibits the unusual phenomenon of casting a true skin at hatching.



Fig. 1.

The discarded skin was minute and trumpet-shaped, and when viewed under a low power of the microscope, showed indications of segmentation and of appendages. Further, on examining eggs and young taken from the egg-chambers, specimens were found showing the existence of this first skin or "molt," in varying degrees of separation from the body. Photomicrographs of spirit specimens of these are shown in figures 1 and 2.

From these it will be seen, that the young form, during its progress along the egg-chamber, is protected by a complete covering, closely fitting the body, and, in addition, covering separately each of the legs. The term *pronymph* is applied to this newly-hatched stage, following its use by other workers for a corresponding stage in the life-history of dragonflies.

When the pronymph moults, the active young form thus released, is really the second larval instar or stage, and it is to this stage that the term *larva* or *nymph* is usually applied. A short description of this stage was given in my previous paper (*loc. cit.*).

Description of the pronymph: The pronymph, as it emerges from the egg-chambers, has the appearance shown in figure 1. The body is gently curved, and is completely invested by the pronymphal sheath, with extensions over each of the limbs, and over the elongate mouth parts, the tips of which can be seen projecting from the body. The relative positions of the antennae



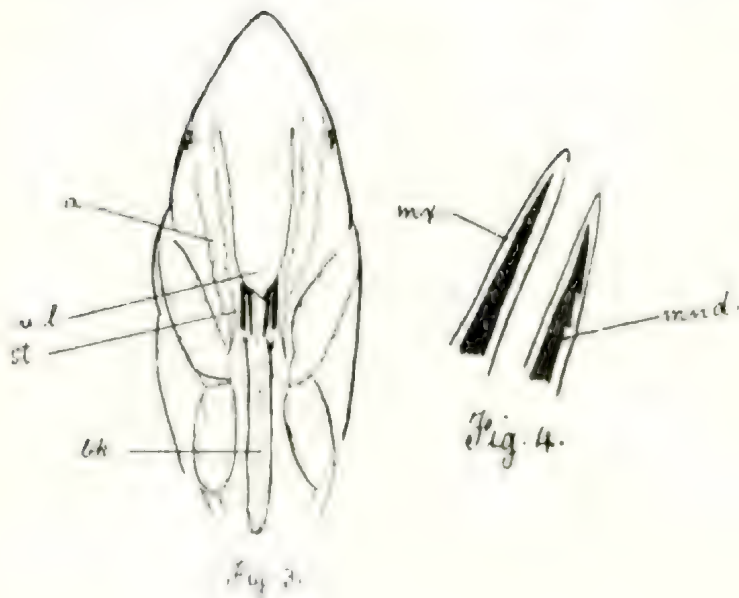
Fig. 2.

and the mouth parts can be seen from figure 3, sketched from the ventral surface of the pronymph. The ensheathed antennae (a) arise by broad bases in front of the eyes and taper to a fine point which extends slightly beyond the tips of the mouth stylets. The mouth parts consist of the broad *labrum* or upper lip (u.l.), the four *stylets* (st.), and the long broad *labium* or beak (bk.), each part being covered by a separate extension of the pronymphal sheath. The outer stylets or mandibles (mnd.) have barbed tips (fig. 4), and are slightly shorter than the inner pair or maxillae (mx.). Dorsal to these, and extending posteriorly a little beyond the fore-femur, is seen the elongated grooved labium or lower lip forming the beak.

Though from the ventral surface the mouth stylets appear short, they are really very long needle-like structures, but the greater portion of their length is held back in the head in a curved position, the terminal portion only, protruding beyond the upper lip. Later on, when the pronymphal sheath is cast, the stylets are supported inside the labial groove, are closely applied to one another, and are fully extended, thus reaching the tip of the labium.

The eyes of the pronymph appear as dark patches, and when examined under the low power, are seen to consist of a collection of irregularly pigmented bodies, sometimes distinguishable into four or five pieces, generally of a purplish or brownish-red colour.

The legs, ensheathed, are extended, not folded in any way, and lie close to the body (fig. 1), the fore-leg reaching to about the level of the fifth and sixth segments of the abdomen, the second pair to about the ninth segment, and the third to the tip of the abdomen (fig. 1). Each leg sheath is bifid at the tip, in the region of the tarsal claws. The abdomen appears to be composed of twelve



segments, the terminal one carrying a short spine (figs. 1 and 2). This spine is doubtless used both as an aid to progression during the passage along the egg-chamber to the exterior, and also as a means of support later on, during the casting of the pronymphal sheath.

The passage of the pronymphs along the egg-nests would no doubt be smooth and gliding, judging from their movements as they emerge from the nests, from which they seemed to "flow."

Ecdysis.—Comparing figures 1 and 2, it would appear that just previous to moulting there possibly occurs both a shortening and thickening of the body, and also an inflation of the pronymphal sheath.

Though I am not able to say what forces are at work during the actual acdysis, it was interesting to note that a number of larvae, freed from the pronymphal skin,

showed a depression on the top of the head, as if this region had previously been inflated. In the light of the existence of a "cephalic heart" in the dragonfly pronymph described by Dr. R. J. Tillyard in his *Biology of Dragonflies*, this depression in the cicada might indicate the possibility of the presence of some such similar organ. In the case of the dragonfly, pulsating of the "cephalic heart" produces an inflation in the head region, which ultimately brings about the splitting of the pronymphal skin.

The Cicada's moulted pronymphal skin, is as already stated, trumpet-shaped, with a large split at the front end. The coverings to the antennae and mouth stylets are clearly seen, but those of the legs are invariably withdrawn into the body part. There was often to be seen a thread of silky material hanging to the cast skin as the larva moved away from it.

The pronymph is necessarily a short-lived stage, lasting only for the period of time taken by it to move along the egg-chamber to the exterior, where, as already seen, the first moult takes place. From the slow gliding movements previously mentioned, the period of time would no doubt extend over some minutes, varying according to the position of the pronymph in the egg-chamber before hatching. The longest time taken to cast the skin completely was found to be forty-five minutes, but often the process was much quicker.

As stated above, the existence of this ecdysis immediately after hatching is not, so far as is known, a common occurrence among insects. In addition to Dr. Tillyard's work on the dragonfly, *Anax papuensis* (loc. cit.), Dr. Balfour-Browne has described and figured a pronymphal stage in Agrionid dragonflies (*Proceedings of the Zoological Society, London, 1909, p. 258*). In the former case, the pronymphal stage lasts only from three to twenty seconds, while in the latter it lasts from two to three minutes. Fabre has referred to a similar stage in the Cicada, the Mantis and other Orthopterous forms, and I find, at the close of my own observations, that R. E. Snodgrass has noted a pronymphal stage in the Cicada, in a paper entitled "The Seventeen-year Locust" (*Annual Report, Smithsonian Institution, 1919, Washington, 1921*).

My thanks are due to Mr. H. E. Albiston, B.V.Sc., of the University Veterinary School, who kindly took the accompanying photomicrographs.

EXPLANATION OF FIGURES:—

Fig. 1—Photomicrograph of the cicada pronymph, as it appears emerging from the egg-chamber.

Fig. 2—Photomicrograph of same, showing sheath separating from the body.

Fig. 3—Ventral view of front portion of pronymph.

Fig. 4—Tips of pronymphal mandibles and maxillae.

THE CORYSANTHES FAMILY OF ORCHIDS.

In a critical review of the Australian species of the genus *Corysanthes* (*Trans. Linn. Soc., N.S.W.*), the joint authors, Rev. H. M. R. Rupp, and Mr. W. H. Nicholls, present the difficulties that have hitherto surrounded the reconciliation of the various recognised species, and more especially such as *C. pruinosa*, *C. fimbriata*, and *C. diemenica*. Much confusion has arisen in the past, but by setting up a new species in *C. dilatata*, and by the exclusion from Victoria of what we have known as *C. pruinosa*, it is hoped that the difficulties will be surmounted, in a large degree. Our *C. pruinosa* has forms recognised in *C. diemenica*, of Tasmania, and of *C. dilatata*, the new species. The number of our four Victorian species has been increased to five, notwithstanding the deletion of one so well known. In Australia and Tasmania, for the future, the species comprising the family will be known as *C. fimbriata*, *C. diemenica*, *C. pruinosa*, *C. dilatata*, *C. undulata*, *C. bicolorata*, and *C. angulata*.

Orchid enthusiasts know how hard it often is to work from herbarium specimens, and not the least difficult is the group known as *Corysanthes*. Mr. Nicholls, of our own Club, whose excellent delineations are so well known, has a full-sized plate devoted to the six of the series he has so skilfully figured, and the large drawings of the labella, so prominent a feature in orchids, will be found of material assistance. The authors are to be congratulated on the information contained in the Review, as well as on the minute details of the drawings and the careful conclusions formed. A useful table is supplied that sets out, side by side, the characteristics of four species that would seem to have close affinities, but which are seen to materially differ from each other.—A.J.T.

AUTUMN BROODS.

Owing to the heavy and continuous rains at the end of last summer, both birds and mammals, in many cases, commenced breeding on a fairly large scale. I have had many reports of wild ducks nesting and breeding, particularly around Cohuna, in the Gunbower swamps. In this locality, also, young quails are very plentiful. I have had reports from practically all over the State regarding the breeding of quail during April and May.—F. LEWIS (Chief Inspector of Fisheries and Game).

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No. 535.

THE FIELD NATURALISTS' CLUB OF VICTORIA.

The forty-eighth Annual Meeting of the Club was held in the Royal Society's Hall, Victoria-street, Melbourne, on Monday, June 11th, 1928. The President, Mr. E. E. Pescott, F.L.S., occupied the chair, and there were about 100 members and visitors present.

DEATHS OF MEMBERS.

The President referred to the death of Sir Aaron Danks, a member of the Club for the past 46 years, and of Mr. Dudley Best, one of the foundation members of the Club, and spoke in feeling terms of their sterling qualities. Members then stood for a brief interval as a mark of respect. The Hon. Secretary was requested to convey the sympathy of the Club to the relatives of the deceased members.

REPORTS.

Reports of excursions were given as follow:—Glen Iris (Fossil Collection), Mr. F. Cudmore; Greensborough to Eltham, Mr. A. E. Rodda.

ELECTION OF MEMBERS.

The following were duly elected on a show of hands:—As Ordinary Members:—Mr. Tarlton Rayment, Bath-street, Sandringham; Mr. A. H. Mattingley, C.M.Z.S., Turner-street, South Camberwell; Mr. Wm. Lawford, Benalla; and Mr. A. C. Bradbury, Australian T. and G. Life Assurance Society, Melbourne; and as a Country Member:—Mr. L. G. Chandler, Red Cliffs, Victoria.

GENERAL.

The President drew the attention of members to the recently reported discoveries by Professor Edgeworth David, in the realm of palaeontology, and asked Mr. F. Chapman, A.L.S., F.G.S., to make some reference thereto. Mr. Chapman responded with some very interesting remarks relative to the immense antiquity of the organisms in question, and the great value of the discovery to science. Mr. Chapman then moved that a letter of congratulation be sent to Professor David; this was seconded by Mr. A. J. Tadgell, and carried unanimously.

Reference was also made by the President to the recent discovery of a remarkable orchid in Western Australia,

which appeared to be of a form entirely new to science.

Notice of motion was given by the President, on behalf of the Committee, as follows:—"That Mr. William Lawford, of Benalla, be elected a Life Member, in view of his valuable gift of a full set of Mathew's 'Birds of Australia' to the Club."

The President announced that the new edition of the "Census of Victorian Plants," was now available, and referred to the valuable and painstaking work performed by Mr. H. B. Williamson, F.L.S., in the revision of the book. He then presented Mr. Williamson with a handsome leather-bound copy of the "Census," as a mark of the Club's appreciation of his services. Mr. Williamson, after expressing his thanks, moved that a letter be written to Mr. J. B. Walker, thanking him for his generous and courteous treatment in the matter of the reprinting of the "Census." Mr. G. Coghill seconded the motion, which was carried. It was notified that 2,000 copies of the book had been printed, of which 500 were bound and available for sale.

ANNUAL REPORT AND BALANCE-SHEET.

The Hon. Secretary read the Annual Report for the year ended April 30th, 1928. Messrs. F. E. Wilson, F.E.S., and F. G. A. Barnard, spoke in complimentary terms of the fine record of achievement disclosed by the report. Mr. Barnard then moved its adoption, which was seconded by Mr. J. H. Harvey, and carried.

The Hon. Treasurer submitted the Balance-sheet and financial statement for the year, and moved their adoption. The motion was seconded by Mr. L. L. Hodgson, and carried. The Hon. Treasurer then moved a vote of thanks to the Hon. Auditors, Messrs. A. S. Blake and W. Ingram. The motion was seconded by Mr. H. B. Williamson and carried unanimously.

ELECTION OF OFFICE-BEARERS AND COMMITTEE.

A ballot was taken for the office of President, and resulted in the election of Mr. F. E. Wilson, F.E.S.

As a result of a ballot, Messrs. A. E. Keep and P. R. H. St. John were re-elected Vice-Presidents.

The following (unopposed) were declared duly elected:—Hon. Treasurer, Mr. A. G. Hooke; Hon. Librarian, Dr. C. S. Sutton; Hon. Editor, Mr. C. Barrett, C.M.Z.S.; Hon. Secretary, Mr. L. L. Hodgson; Hon. As-

sistant Secretary and Librarian, Mr. H. B. Williamson, F.L.S.

A ballot was conducted for Committee, and resulted in the election of the following members:—Messrs. G. Coghill, C. Daley, B.A., F.L.S., V. H. Miller, and A. E. Rodda, and Miss J. W. Raff, M.Sc., F.E.S.

After the declaration of the election of the various office-bearers and members of Committee, Mr. E. E. Pescott vacated the chair, in favour of Mr. F. E. Wilson. The new President returned thanks for the honour which had been conferred upon him, and said that he would do his best to justify the Club's choice during his term of office.

CONVERSAZIONE.

The meeting took the form of a *Conversazione*, with special exhibits by members, who gave short descriptions thereof. Mr. H. B. Williamson, F.L.S., showed an interesting series of lantern views of various forms of plant and animal life.

EXHIBITS.

By Mr. E. E. Pescott, F.L.S.—Pot plants of rare Mexican Cacti: (a) *Cephalocereus senilis* (Old Man); (b) *Anhalonium Williamsi* (Dumpling Cactus); (c) *Echinocereus de Lacti* (Grizzley Bear); (d) *Mammillaria senilis* (Old Man, Junr.); (e) *Astrophytum myriostigma* (Bishop's Cap).

By Mr. A. S. Kenyon.—Specimens of *Eucalyptus gracilis*, *E. oleosa*, *E. radiata*, *E. uncinata*, and *E. calophylla*; also *Hakea laurina*.

By Mr. F. G. A. Barnard.—Specimen of *Cryptostemma calendulaceum* (Cape Weed), flowering out of season, from Croydon; and growing plant of Meadow Moonwort, an annual fern. This plant was collected at Oakleigh in September, 1887, and its history was given in the *Victorian Naturalist* for November, 1927.

By Rev. W. C. Tippet. —Photo. of *Casuarina suberosa*, growing from stump of Red Gum, near Bairnsdale (no other sheoaks in locality).

By Miss M. L. Wigan.—Specimen of *Grevillea rosmarinifolia*, from hedge at Ivanhoe Grammar School.

By Mr. A. H. Mattingley, C.M.Z.S.—Papuan necklace formed of the upper mandibles of Hornbills.

By Mr. V. H. Miller.—(a) Flowering specimen of *Stylidium despectum* (Small Trigger-plant), from

Wattle Glen (out of season); (b) Orchids—*Pterostylis alata*, *P. parviflora*, *P. nutans* and *Acianthus exsertus*, from Wattle Glen, 9/6/28; and *Pterostylis longifolia*, from Belgrave.

By Mrs. E. S. Hanks.—Nest of Whipbird (*Psophodes olivaceus*), from Wandin (Vic.).

By Mr. W. H. Nicholls.—Specimens in formalin solution of *Corysanthes fimbriata*, R.Br., collected by T. S. Hart, Bairnsdale; and *Corysanthes unguiculata*, R.Br., collected by Mrs. Sutherland, at Airey's Inlet (new locality).

By Mr. C. Borch.—Five species of Victorian Sphingids (Hawk-moths), including the rare *Celerio lineata* and *Cacquosa triangularis*. The famous English "Death's Head" is a member of this family.

By Mr. H. P. Dickens.—Painting of *Pterostylis grandiflora* (Long-tongue Greenhood).

By Mr. F. E. Wilson, F.E.S.—Eight species of Longicorn beetles belonging to the Wasp-mimicking genus *Hesthesis*, viz., *H. cinbulata*, Kirby; *H. plorator*, Page; *H. montana*, Cart. ms. paratype; *H. ferruginea*, Boisd.; *H. acutipennis*, Page; *H. variegata*, Fab.; *H. crabroides*, Cart. ms., paratype; and *H. vigilans*, Page.

By Miss J. W. Raff, M.Sc., F.E.S.—(a) Cicada pro-nymph (newly-hatched), undergoing a true moult as described by the exhibitor in *June Naturalist*; and (b) Living Land Planarians (*Geoplana sugdeni* and *G. alba*), from Upper Macedon.

By Mr. P. R. H. St. John.—(a) Fruit of *Adansonia Gregorii*, F. v. M. (Australian Baobab). The interior substance of the fruit has an agreeable acidity, and, boiled with sugar, is of material service in scorbutic complaints; (b) Specimen of *Pisonia inermis*, Forster, 1776 (Bird Catching or Bird-lime Tree). The fruits of this and other species were used by the natives for catching birds, and were spoken of as the "he-kapau kapili manu," or "bird-lime."

By Mr. A. E. Opperman.—Young *Xamia* Palm, in pot.

By H. B. Williamson, F.L.S.—Specimen of *Lepidosperma Forsythii*, A. A. Hamilton, a sedge not previously recorded for Victoria, collected at Cannibal Creek, Bunyip, by the exhibitor during the Club Excursion to Bunyip, December, 1925. Common name suggested—Stout Twisting Sedge. Eighteen species of *Liliaceae*, illustrating the "Lilies of Victoria," Part II.

ANNUAL REPORT.

To the Members of The Field Naturalists' Club of Victoria:—

Ladies and Gentlemen,

In presenting for your consideration the forty-eighth annual report, covering activities for the year ended April 30th, 1928, your Committee desires to express its gratification at the progress made by the Club during the term. Not only has the success of previous years been maintained, but the Club has materially advanced in the year under review, while the prospects for the ensuing twelve months are very encouraging.

The membership during the period under notice has shown a considerable increase, 80 new members having been elected (60 Ordinary, 18 Country, and 2 Associates), while 26 names have been removed on account of deaths, resignations and other causes, leaving a net increase of 54. There are now 2 Honorary, 9 Life, 260 Ordinary, 82 Country, and 11 Associate Members, making a total membership of 374, as compared with 320 at the end of the previous term.

It is with much regret that your Committee has to record the deaths of several old and valued members of the Club. In July last, Mr. W. H. A. Roger, a member of 25 years' standing, and a former office-holder, passed away; another old member, in the person of Mr. E. R. Hammett, who joined the Club in 1887, also passed away in September. During December, the deaths occurred of Dr. George Horne, the well-known ethnologist, and Mr. R. E. Luher, B.A. Dr. Horne, on various occasions, contributed valuable papers at the Club meetings, while Mr. Luher was noted among members as a keen geologist.

Excellent attendances have been a gratifying feature of the monthly meetings; an average attendance of well over 100 members and visitors has been maintained throughout the year, the accommodation being on several occasions overtaxed. Papers and lectures on various aspects of natural history were contributed by Miss R. S. Chisholm, B.A., Messrs. E. E. Pescott, F.L.S., G. Coghill, F. Chapman, A.L.S., F.G.S., F. G. A. Barnard, L. L. Hodgson, C. Barrett, C.M.Z.S., A. D. Hardy, A. H. Mattingley, C.M.Z.S., J. A. Kershaw, C.M.Z.S., C. Daley, B.A., F.L.S., and J. H. Harvey, Rev. W. C. Tippet, F.L.S., and Professor T. D. A. Cockerell, of the Uni-

versity of Colorado, U.S.A. A wide variety of subjects was dealt with, the interest and value of the papers and lectures being considerably increased by the use of lantern slide illustrations.

A comprehensive programme comprising forty excursions was arranged early in the year, and, although circumstances occasionally necessitated the abandonment of an outing, the arrangements for the remainder of the fixtures were duly carried out. The excursions have, on the whole, been well attended, the opportunities for field study under competent leaders being largely availed of by members. Half-day outings took place to numerous localities in and around the metropolis, while full-day visits were made to Mitcham, Hume Vale, Kinglake West, Macedon, Nyora to Loch, and Wandin. More extended excursions comprised two "Camp-outs," the first at Sealers' Cove (Wilson's Promontory) for eight days during the Christmas holidays, under the leadership of Mr. C. Daley, B.A., F.L.S., and the other at Forrest (Otway Forest) for five days at Easter, in charge of Mr. H. B. Williamson, F.L.S. A week-end visit was also paid to Phillip Island, in January, when opportunity was taken to inspect the Mutton-bird rookeries at Cape Woolamai and the Penguin rookeries at the Nobbies.

With the completion of the forty-fourth volume of the *The Victorian Naturalist*, the Club is again indebted to Mr. Chas. Barrett, the Editor, for his untiring efforts to maintain the high standard of our journal. A valuable series of articles on the "Aquatic Plants of Victoria," by Mr. H. B. Williamson, F.L.S., and a most interesting account of the "History of the *Flora Australiensis*," by Mr. C. Daley, B.A., F.L.S., were published during the year, in addition to many shorter articles and papers of much interest by various authors. In this connection, your Committee desires to refer to the difficulty experienced by the Editor in obtaining sufficient suitable matter for publication in the *Naturalist*, and, as it is confidently felt that many of our members could materially help by contributing original articles on various natural history subjects, an invitation is extended to such members to afford the Editor their assistance in this direction. Short notes for the "Field and Study" section of the journal are also desired.

In July last, a Natural History Exhibition was held in the Independent Hall, Collins Street. A wide and varied collection of natural history objects was displayed, com-

prising exhibits of birds, eggs, shells, geological specimens, aboriginal weapons, and implements, plants and microscopic objects. Experts were in attendance at the various sections for the purpose of affording information to members and the general public regarding the exhibits under their charge. The Exhibition, which was opened by the Chief Secretary (Hon. G. M. Prendergast), was well attended throughout the day. The main object in organising the function was to stimulate and foster interest in natural history, and, while the results in this direction may be regarded as very satisfactory, the Exhibition was also successful from a financial point of view, the funds of the Club benefiting to the extent of £26/17/4.

The annual Wild Flower Show was held in the St. Kilda Town Hall on Tuesday, September 27th, and was opened by His Excellency the Governor (Lord Somers), accompanied by Lady Somers, in the presence of a large gathering. Although somewhat handicapped by the unfavourably dry season, which restricted the supply of flowers, the Show was most successful. It is estimated that over 2,000 persons attended during the afternoon and evening, the demand for wild flowers and native plants in pots rapidly exhausting the available supplies. A net profit of £93/17/8 resulted, which might be considered quite satisfactory, having regard to the adverse seasonal conditions.

Several matters of importance have engaged the attention of the Club during the past twelve months. Chief among these was the formation of the Victorian Advisory Council for Fauna and Flora, for the purpose of advising the Chief Secretary on matters pertaining to the fauna and flora of the State. This Club is represented on the Council by Messrs. E. E. Pescott, F.L.S., and Chas. Barrett, C.M.Z.S. While the representation of the Council generally might not be regarded as altogether satisfactory, inasmuch as such bodies as the Royal Society, Australian Forest League, Victorian Society for the Protection of Animals and other scientific and nature societies are not represented thereon, still it is confidently expected that valuable results will be achieved in regard to the preservation and conservation of all forms of wild life.

In view of the decay and gradual disappearance of the tea-tree along the Eastern foreshore of Port Phillip Bay, the Club undertook, in August last, an investigation into

the causes of such decay. The foreshore from Brighton to Mornington was divided into sections, which were closely examined by members of the Club experienced in botanical and entomological investigation, with the object of reporting upon conditions and suggesting remedial measures. A public meeting was held in the Queen's Hall, Collins-street, in September, at which a full report was presented dealing with the various causes contributing to the deterioration of the tea-tree, and suggesting that a Foreshore Committee be appointed to control the whole of the affected areas. Owing to the difficulties attendant upon the carrying out of the proposal, the matter has remained temporarily in abeyance, but it is intended to bring it before the recently constituted Victorian Advisory Council for Fauna and Flora, with a view to inducing the Government to take the necessary action for the preservation and restoration of the tea-tree.

In July last, the Club received from an anonymous donor, through the good offices of Mr. R. D. Elliott, a donation of £200 for the purpose of financing special expeditions to various parts of the state which have not yet been thoroughly investigated from a scientific point of view. The first of these expeditions was organised early in October, under the leadership of Mr. E. E. Pescott, F.L.S., who, accompanied by a party of four other members: Messrs. C. Daley, B.A., F.L.S., C. Barrett, C.M.Z.S., H. B. Williamson, F.L.S., and V. H. Miller, proceeded on a tour of the Western District, touching at Mt. Arapiles, Mt. Zero, Lake Lonsdale, and other points of interest en route. Some 700 miles were covered, and a considerable quantity of valuable material was collected for examination and subsequent presentation to the National Museum and National Herbarium.

Reports in regard to the work performed, together with accounts of the flora, insect life, and geological features, as well as the ethnological interest of the district, were submitted at the May meeting of the Club, and revealed that much data of value had been recorded. The expenses of the expedition totalled about £80. Arrangements have already been initiated for further visits by prominent Club members during the coming spring months to Lake Mountain (near Marysville), Mt. Drummer (East Gippsland), and an area in the North-Eastern corner of the State—to be financed from the balance remaining in the special fund. In view of the interest of Mr. R. D. Elliott in obtaining this munificent

gift to the Club, thus enabling such excellent work to be carried out, notice of motion was given at the April meeting that Mr. Elliott be elected a Life Member, and his election as such was unanimously agreed to at the following meeting.

A most valuable presentation was made to the Club in April by Mr. William Lawford, of Benalla, consisting of a full set of twelve volumes of Mathew's "Birds of Australia," splendidly bound in morocco. This fine gift was made on the recommendation of Mr. Donald Macdonald, and the thanks and appreciation of the Committee and members have been conveyed to both of these gentlemen.

The Club is greatly indebted to Mr. V. H. Miller, for several valuable and useful gifts during the year. In order to facilitate the secretarial work of the Club, Mr. Miller thoughtfully provided a typewriter, a gift which the Hon. Secretary, in particular, much appreciates. Further donations by Mr. Miller include a set of the recently published "Australian Encyclopaedia" for the Library, and a handsome Queensland Maple cabinet for the safe keeping of the 12 volumes of Mathew's "Birds of Australia," presented by Mr. W. Lawford. As a mark of appreciation of these and other benefactions conferred on the Club, and also of the valuable services rendered by Mr. and Mrs. Miller in past years, Mrs. Miller was unanimously elected a Life Member at the January meeting.

Your Committee, early in the year, considered at some length the proposal of a change in the Club Badge, and decided that, in view of the unpopularity of the badge then in existence, it was desirable to introduce a new design, which would have a stronger appeal to members. The symbol decided upon as the most suitable for this purpose was the Red Correa (*Correa rubra*), and the Committee is indebted to Mr. H. P. Dickens, who kindly executed the drawing of the necessary design. The new badge was made available in September, and members have responded readily to the request that they obtain and wear it at the various meetings and excursions of the Club.

The rules of the Club were amended at the May (1927) meeting, to provide for the payment by newly-elected members of their first year's subscription in full (instead of a half-yearly subscription for members elected after November 1st each year)—any adjustment to be effected in the subsequent term.

The recently formed "Prehistoric Club" was admitted as an Ethnological Section of this Club during December, on the understanding that the members of the first-named Club also became members of the Field Naturalists' Club. The Ethnological Section meets at the Royal Society's Hall on the first Thursday each month for the purpose of transacting general business, and the reading of papers, etc., several interesting meetings having already been held.

Your Committee again wishes to acknowledge its indebtedness to Messrs. Coghill and Haughton for kindly placing their rooms at the Club's disposal for Committee meetings. Thirteen meetings were held during the year, attendances being as follow:—Messrs. H. B. Williamson and L. L. Hodgson, 13; Mr. V. H. Miller, 12; Messrs. A. E. Keep, P. R. H. St. John, C. Daley and J. W. Audas, 11; Messrs. E. E. Pescott and C. Barrett, 10; Messrs. F. Chapman, J. A. Kershaw, G. Coghill and A. G. Hooke, 7; and Dr. C. S. Sutton, 5.

In conclusion, your Committee wishes to express its thanks to all who have rendered assistance during the term in upholding and furthering the objects and influence of the Club. Your Committee also looks forward with confidence to the same generous measure of support during the ensuing term, that has been accorded in previous years, and is hopeful that the activities of the Club will continue to be maintained with the enthusiasm and interest manifested in the past.

E. E. PESCOTT, President.

L. L. HODGSON, Hon. Secretary.

FIELD NATURALISTS' CLUB OF VICTORIA.

STATEMENT OF RECEIPTS AND EXPENDITURE FOR TWELVE MONTHS ENDED APRIL 30th, 1928.

RECEIPTS.

To Balance in Bank on May 1,			
1927			£24 7 8
„ Subscriptions—			
Town Members—			
Current year	£189	8	6
Arrears	40	12	6
In advance	13	11	6
Country Members—			
Current year	36	19	6
Arrears	11	0	0
In advance	5	10	0

Associate Members—			
Current year	2	5	0
Arrears	0	17	6
In advance	0	10	0
	<hr/>		
	£300 14 6		
" Victorian Naturalist—			
Subscriptions	2	9	0
Cash Sales	3	13	4
Advertisements	7	4	0
Reprints Charged	1	12	6
	<hr/>		
	14 18 10		
" Donations—			
To Publishing Fund		1	10 0
" Purchase of Australian Encyclopaedia		5	0 0
" Interest from Savings Bank..		7	4 8
" Sale of Club Badges		11	5 6
" Plant Census Account—			
Sale of books in year		16	11 0
" Natural History Exhibition, July 20th, 1927—			
Ticket Sales	21	18	0
Cash at Doors	15	18	0
Sale of Plants	12	0	0
Donations	0	10	6
	<hr/>		
	50 6 6		
" Wild Flower Exhibition, Sept. 27th, 1927—			
Ticket Sales	35	17	0
Cash at Doors	74	1	0
Sale of Plants, Flowers and Refreshments	58	12	1
Donations	0	12	0
	<hr/>		
	169 2 1		
	<hr/>		
	576 13 1		
	<hr/>		
	£601 0 9		

EXPENDITURE.

By Victorian Naturalist—			
Printing	£233	12	1
Illustrating	32	18	9
Wrapping, Despatching and Postage	27	4	3
Reprints, Free	21	10	9
Reprints, Charged	1	6	0
	<hr/>		
	£316 11 10		
„ General Printing		7	18 6
„ Library Account — Periodi- cals and Books Purchased ..		6	2 5
„ Badges—Cost of New Supply		23	6 8
„ Plant Census Account.. . . .		0	7 4
„ Tea-Tree Movement, Ex- penses of Meeting		3	10 6
„ Donation to Advisory Coun- cil for Fauna and Flora.. . .		1	1 0
„ Presentation to Hon. Treas- urer		5	5 0

" Postage, Bank Charges, Insurance, and Sundries	11	12	3
" Natural History Exhibition—			
Hire of Independent Hall	6	10	0
Purchase of Plants for Sale	6	10	8
Printing and Postage	2	16	9
Cartage and other charges	7	11	9
	23	9	2
" Wildflower Exhibition—			
Hire of St. Kilda Town Hall	14	14	0
Purchase of Plants and Flowers	22	6	4
Printing and Advertising	9	14	6
Hire, Cartage, Freight, and other expenses	27	8	7
	74	3	5
" Wildflower Exhibition, 1928, deposit on hire of hall	1	1	0
" Transfer to Savings Bank Account	75	0	0
	549	9	2
" Balance in Bank on April 30th, 1928	51	11	7
	£601	0	9

SPECIAL TRUST ACCOUNT.

RECEIPT.

To Amount of Donation Received	£200	0	0
	£200	0	0

EXPENDITURE.

By Travelling Expenses and Hire of Materials	£55	10	0
" Provisions and Stores	21	0	0
" Photography	4	10	0
	£81	0	0
" Balance in Bank on April 30th, 1928	119	0	0
	£200	0	0

STATEMENT OF ASSETS AND LIABILITIES ON

APRIL 30th, 1928.

ASSETS.

Arrears of Subscriptions, £103; estimated to realise	£60	0	0
English, Scottish & Australian Bank	51	11	7
Do. Special Trust Account	119	0	0
State Savings Bank	250	0	0
Library and Furniture, Insurance Value	130	0	0
Stock of Badges on hand, cost, less sales	12	1	2
Plant Census Account, difference between cost and sales of books	121	19	2

Accounts Owing to Club—			
For reprints, Charged	£0	5	0
For Advertisements in <i>Naturalist</i>	2	5	0
	<hr/>		
		2	10 0
	<hr/>		
	£747	1	11

LIABILITIES.

Subscriptions Paid in Advance	£19	11	6
Balance of Char-a-banc Fund	2	12	0
Outstanding Accounts	37	12	11
Special Trust Account	119	0	0
	<hr/>		
	£178	16	5

A. G. HOOKE, Hon. Treasurer, June 5th, 1928.

Examined and found correct—

A. S. BLAKE Hon. Auditors.

W. H. INGRAM

June 8th, 1928.

EXCURSION TO GREENSBOROUGH AND ELTHAM.

Fourteen members and friends took part in the excursion from Greensborough to Eltham on King's Birthday. From Greensborough the route taken was across the Plenty River, then up a road to the right to St. Helena, where a halt was made to inspect the historical little church of St. Katherine's. From here the road was followed as far as the Maroondah aqueduct, thence along the pipe-line to the Diamond Creek Road, and turning off to the right across country, to the Creek. Being winter time, very few wildflowers were blooming, but many species of plants were identified. *Correa rubra* was found in bloom, and some particularly large flowers of this species were collected.

Near the aqueduct a patch of *Chielanthes Sieberi*, a rather rare Rock-fern, was found. Some seedlings of the Red Cypress Pine (*Callitris calcarata*) were found beneath some of these trees, planted along the pipe-track. Near the aqueduct bridge some fine bushes of the Purple Apple Berry (*Billardiera scandens*), with very large ripening fruits, were noted. A heap of rocks from the excavations yielded some indistinct organic remains. Numerous plants of Greenhood orchids not yet in flower were seen by the roadside, and also two species of *Cassinia*, *C. aculeata* and *C. arcuata*—the latter being the "Chinese Scrub" that is troublesome in the Bendigo district. Mr. P. R. H. St. John identified many species of Eucalypts. This locality gives great promise for wild-flower collecting in the spring.

Diamond Creek was followed down for about a mile, across several railway bridges and through groves of the Silver Wattle to an abandoned mining tunnel and battery site. A little desultory fossicking over the old ore-paddocks yielded no auriferous results, though a large flattened black spider was uncovered and neatly boxed by a lady member. Crossing a paddock on the up-hill side of the line, some Eucalypts not previously noted were found in a well-timbered lane, which was followed to its junction with the main road, near the rising young township of Glen Park. Among the few species of birds noted was a Wedge-tailed Eagle.—A. E. RODDA.

THE LILIES OF VICTORIA.

BY H. B. WILLIAMSON, F.L.S.

Part III.

Genus STYPANDRA.

Distinguished from *Dianella* by having the filaments bearded, not tumid, and from the next two genera by the coiled anthers. Leaves in two rows along the stem, pedicels recurved *S. glauca*
 Leaves nearly all basal, pedicels erect *S. caespitosa*

STYPANDRA GLAUCA, R.Br. Nodding Blue-lily. Fig 1.

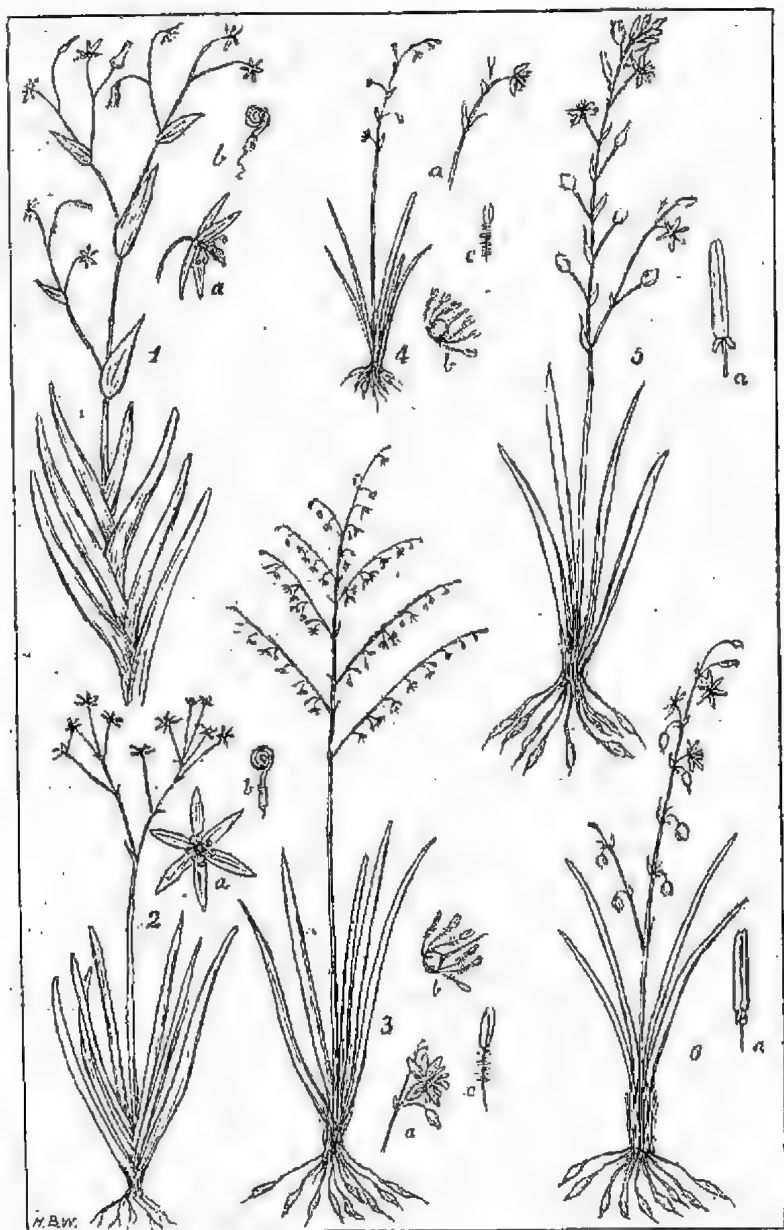
A perennial with stems on a creeping rhizome, tufted or bushy up to 4 feet high, with leafy stems, woody and branched at the base. Leaves in two rows, with sheaths usually concealing the stems, somewhat flattened, with an acute keel, the blade usually about 3 inches long, but sometimes twice that length. Flowers (a) in a loose, dichotomous cyme, on thin recurved pedicels, mostly solitary, but sometimes two together at the ends of the branchlets. Sepals and petals dark blue, acute, five-nerved. Stamens shorter, filaments slender, and twisted in the lower half, with a dense, oblong tow-like tuft of hairs under the anthers, which are yellow, shorter than the filament, and much coiled, almost spiral after shedding the pollen; (b) a very common plant seen at its best on rocky hillsides. Occurs in all districts, and also in all States but S.A. and Tas.

STYPANDRA CAESPITOSA, R.Br. Tufted Lily. Fig. 2.

This has stems leafless except at the base. Leaves are mostly basal, with very short distichous sheaths, erect, 6 inches to 1 foot long, and nearly $\frac{1}{2}$ inch broad. Scapes leafless, or occasionally with one or two short leaves with long sheaths. Inflorescence loosely dichotomous, and occupying about half of the total height of the plant. Pedicels not recurved as in *S. glauca*. Sepals and petals blue or yellowish inside, or very rarely white. Filaments densely covered with very short, cottony hairs almost from the base (b). Anthers rolled back after shedding the pollen. Growing in damp, heathy scrub in all districts but the N.W. Occurs also in all States but W.A. and S.A.

Genus ARTHROPODIUM.

Comparatively tall, much branching . . *A. paniculatum*
 Comparatively dwarf, scarcely branching . . . *A. minus*



1. *Stypandra glauca*. 2. *S. caespitosa*. 3. *Arthropodium paniculatum*. 4. *A. minus*. 5. *Dichopogon strictus*. 6. *D. fimbriatus*.

ARTHROPODIUM PANICULATUM, R.Br. Pale Vanilla Lily,
Fig. 1.

An erect, branching plant up to two feet, with fibrous roots thickened into tubers, but only at a distance from the stock. Leaves basal, to nearly a foot long, with broad, scarious sheathing bases. Flowers in twos or threes along the branches, white or purplish, on very thin pedicels, thus pendulous, in the axils of minute bracts. Sepals and petals 3 or 4 lines long, the latter much broader and sometimes fringed on the margin. Filaments with a dense tuft of woolly hairs above the middle (c). In all parts of the State, and in all States but W.A.

ARTHROPODIUM MINUS, R.Br. Small Vanilla Lily. Fig. 4.

A much smaller and less branching plant, usually 6 inches to 1 foot in height with roots a bundle of tubers close to the stock. Leaves basal, much shorter than the stem. Flowers solitary within each bract, or rarely two together, usually smaller and darker in colour and with anthers and style shorter than those of *A. paniculatum*. Filaments longer than the anthers, the woolly hairs extending over the greater part of their length (c). Found in all parts of the States, and in all States but W.A. and Queensland.

Genus DICHOPOGON.

This genus is closely allied to *Arthropodium*, and was formerly included in it. In *Dichopogon*, the woolly appendages are attached to the anther instead of to the filament.

D. STRICTUS (R.Br.), J. G. Baker, Chocolate Lily. Fig. 5.

Stems from under 1 foot to above 2 feet high. Flowers almost always solitary, rather large, purple, and distinctly vanilla-scented. Pedicels erect, spreading or recurved, shorter or longer than the flowers. Sepals and petals 3-nerved in the centre, remaining straight when withering; appendages of the dark-coloured anthers usually short and crest-like (a); capsule erect. Very common in all districts, and found in all States but W.A.

DICHOPOGON FIMBRIATUS (R.Br.), J. M. Black. Nodding Chocolate Lily. Fig. 6.

Distinguished from *D. strictus* by its flowers, usually in clusters of from 2 to 4; its yellowish anthers; anther appendages closely appressed to the filament; and its capsules always on reflexed stalks. Roots are similar, but the bases of the leaves are usually surrounded by numerous straight, brown fibres, while these in *D. strictus* are replaced by a few scarious leaf bases. Apparently this plant has been rarely gathered in our State,

as the only Victorian specimens in the National Herbarium are from "Murray Desert," Mueller; "Borong" and "Wimmera," Reader; Southern Grampians, H.B.W., and Swan Hill. Its record for "all districts" seems doubtful, owing probably to wrong determinations. It occurs also in S.A., N.S.W., and Queensland.

WILDFLOWERS OF THE VELDT.

An article on Australian wildflowers in the Xmas number of "Table Talk" (November, 1927), prompted Mr. Leslie Gray, of Claremont, South Africa, to write to the Hon. Secretary of our Club. Following are excerpts from his letter:

"I am a keen field botanist and my keenest delight, of a week-end, is to get out in the veldt, or up in the mountains, studying our flora and collecting a few bulbs for my garden. It is a great tonic and peaceful relaxation for one practising as a dental surgeon all the week. I was born in Australia, but came over here at an early age. I spent several holidays on farms around Lilydale and Gippsland districts, as a kiddie. Well do I remember the beautiful little orchids we gathered at Lilydale, also wild violets. Gippsland Lakes I always associate with bell-birds.

"Shortly after the outbreak of war, I was in Australia, but soon joined up with Cohen's Brigade (2nd Div. Artillery), and was with them until gassed at Passchendale, when I was invalided back to Australia, and discharged. I went to Sydney, as its climate suited me best, and spent some happy times collecting flannel-flowers, etc., around the hills across the lake at Narrabeen, and waratahs in the Blue Mountains. I remember a pretty *Dendrobium* type of orchid near the Jenolan Caves. Here we have a great profusion of rare and beautiful wildflowers, much despised by the average person, who lazily prefers stocks or cabbages.

"Mr. Charles Barrett's article has stimulated a desire to obtain some of the wildflowers mentioned by him—particularly the orchids, wild violet and fringed violet. I also would love to get some flannel-flower seeds and waratah seeds. . . . Here, in the Cape Peninsula alone, we have over 1,000 flowering plants; many, of course, diminutive, and only of botanical interest. We have 110 orchids, of which probably only 20 are worthy of growing. Nerines are very plentiful on the mountains; these, I know, are grown in Australia; also a few other varieties. I know a dealer here who ships bulbs of a few commoner varieties to a nursery along Frankston way.

"We have a wide range of Gladioli—some small and delicate! others, large and beautifully scented, in pink or a transparent brown or blue—non-scented, in red, cream, and blue. Stapelias, another interesting flower, little known, but interesting from the fact that the flowers have the smell of bad meat, to attract the blowfly, for fertilization. Some of the flowers are star-shaped, fleshy and hairy, and as big as a saucer; others, smaller, wrinkled, and spotted yellow, and darker. Another hobby of mine is making a collection of our wildflowers in silver. It will take years, of course. I have a large number of specimens already, perfect in every detail, except colour and scent."

NOTABLE NATURALISTS. II.—PROFESSOR
OWEN.

BY EDWARD A. VIDLER.

When, at Mr. Charles Barrett's request, I asked my sister in England to send me the old photographs of John Gould, my mother's godfather, out of our family album, she sent me also several other of those old "carte-de-visites" of my parents' friends, representing them at earlier ages than when I knew them. Among these were the pictures of Professor Owen, later Sir Richard Owen, and his wife. I did not know Mrs. Owen, but heard of her as a genial soul. I knew Sir Richard very well,



Sir Richard Owen.

when I was in the early 'twenties, and used to pay Sunday afternoon visits to the dear old man, at the suggestion of my grandfather, Dr. George Bennett, of Sydney, himself well known as a naturalist, and one of Gould's

most intimate friends: he was a very constant correspondent of Professor Owen for many years.

At the time I knew him, in the middle 'eighties, until his death a few years later, Sir Richard Owen was living with only his daughter-in-law and a maid-servant, at Sheen Lodge, a comfortable and picturesque cottage in Richmond Park, near London, as a pensioner of the Government, the cottage being nominally in the gift or loan of Queen Victoria. I would go over from my lodgings in West Kensington on a tricycle, a quite up-to-date means of travelling in those days, and one which at first interested him considerably, even to the extent of taking a short ride on it in the park.

My visits seemed to be welcome to the old man, who said that he was lonely; his son and only child, who was afflicted mentally, had recently come to a tragic end, and I never met his daughter-in-law. The professor was then about eighty, but was by no means decrepit, and was bright and sociable and unaffected, rather inclined to a somewhat impish humour, though some of his jokes would strike me as not very spontaneous.

Richard Owen was tall and thin, with big hands and feet, square shoulders, a large head, with a very prominent high forehead and very deep-set large grey eyes, high cheek bones, a long heavy nose with broad nostrils, very wide, thin-lipped mouth, square chin, over which grew a long beard of black hairs so sparse that the contour of the chin was clearly visible, and long, thin, straight dark hair surmounted by a black skull-cap. He wore a long black frock-coat and carpet-slippers. He was, in fact, a fearsome looking figure at first sight, but with an air of friendliness and gentleness the very antithesis of his outward appearance.

G. F. Watts, Robert Browning, and Richard Owen were the greatest of the men of that time with whom I had an acquaintance, which in the cases of the first and last, soon ripened into friendship. Owen, like Watts, was the humblest of souls, and many a happy afternoon I spent in the company of either, though Watts received me only in his studio, but seemed always glad to have me there.

I would usually stay to tea with Professor Owen, the cloth being laid for the two of us at one end of the long table in what appeared to be the general living-room. There were scientific "exhibits" about this room and his small study, and I remember a characteristic joke of the

old man's in connection with one of them—a vertebra bone, apparently, of a whale, but perhaps something more valuable. During tea-time I saw his eyes twinkle when my plate was empty, and he quickly asked me if I would like some more bread, and, on my assenting, grabbed this bone and handed it to me, saying: "You ask me for bread and I give you a stone," with that broad grin of his, surely the broadest that ever was! He was so pleased with his joke that I suspect it was deliberately planned. Perhaps his sportiveness was his idea of entertaining youth.

But he could be very serious sometimes, and I would make a point of getting him on to his own subjects when I could. Although I had no special interest in natural history, my tastes lying in a different direction—towards art and literature and the drama—I would "ready-up" scientific questions to ask him. I remember one of these was, "How did you make a restoration of the extinct moa from such small evidence?" and he said at once, "By instinct." When I showed that I was puzzled he added, "I had, as you say, very small evidence in actual objects, but much general knowledge, and your grandfather in Sydney helped me in some particulars, as he had often travelled in New Zealand, and we have always corresponded; and so bit by bit, led on by instinct, I built up that wonderful bird in skeleton and clothed it in the same way." (I can't, of course, guarantee that word for word, but it is correct in substance). Then I asked him if he was satisfied that he had made no mistakes, and he said very confidently, "Certainly; entirely so."

Of the many interesting things Professor Owen showed me at various times, most of which I have forgotten, there were two that I do remember. One was a small, flat stone object, that bore a striking resemblance to an owl's eye, with black, white, and brown in circles, and of the same size and contour. When he put it into my hand, I said at once, "A fossilized owl's eye," and he said, "That's exactly what the beautiful princess said." Then he told me that, when he was travelling in Egypt with the then Prince and Princess of Wales, the Princess (afterwards Queen Alexandra) picked this object up and brought it to him with that exclamation. I asked him what it really was, and he confessed frankly that he did not know, but he did know that the resemblance, though striking, was purely accidental, saying that nature often indulged in little jests like that.

But the other recollection is of something much more important. I remember very vividly a book, one of two or three, bound in a shiny green silk limp cover, the hundred or so leaves being of a strong almost transparent paper, folded double as in Japanese books. He handed the book to me with a careful air, holding it in both hands and laying it on the table in front of me. He told me to turn each page, or rather the two pages (the under one of which was blank) singly, keeping it perfectly straight and holding it by the lower cover. The first page, under protecting tissue-paper, and all succeeding ones, had in its centre what looked like an exquisitely detailed painting of a butterfly; at least the body was certainly painted. As I gazed at it entranced, the Professor held a powerful large magnifying glass over the butterfly, and at once it sprang, as it were, to life, its brilliant wings covered with a multitude of coloured scales.

I gave an exclamation of delight and wonder, and the Professor laughed with pleasure. "Now turn the other leaves and hold the glass yourself." I looked at two or three, and then exclaimed, "I can't; I daren't. It is too wonderful," and put the book aside, more scared than anything else. "Daren't what?" he asked. "Turn any more leaves," I said, "I might do some damage." "Not if you're ordinarily careful," he assured me, but I felt too hot and bothered. I said, "That collection must be the only one in the world," to which he replied, "I don't know about that, but it is priceless—to me."

TAME WILD MARSUPIAL.

On a showery day, in March, we were picnicing at Bulga Park, in the Strezlecki Ranges. For a few minutes we left our lunch spread on the ground, and, as we returned to it my companion exclaimed, "What's that?" and looking where she pointed, I saw a little marsupial (a Rat-Kangaroo?), sitting on the tablecloth, with a sandwich held between its forepaws. It seemed to be oblivious to our presence, as it sat nibbling happily at the bread. Not until the cloth was disturbed, did the little animal move, and even then hopped only a few yards, to the entrance to a hole beside a log. There, still holding a piece of the sandwich, it paused and continued the meal. During the next half-hour we fed it with pieces of bread and meat, and even stroked it. Once or twice it hopped away, but always returned, and once came right across the cloth again. As I lifted it off, it gave a startled squeal, and the moment it was released, fled, but soon was beside us again. Surely such trustfulness is very unusual, unless the animal had become used to visitors and had often been fed; but as Bulga is still known only to comparatively few persons, this seems very improbable.—J.G.

JOHN HOPSON—NATURE LOVER.

He served Science, not desiring fame, but because he loved Wild Nature. Served almost humbly, though pleased when he made discoveries, recorded in scientific journals. And he was very willing to help others to find new plants and insects. His realm was the Barrington Tops, in New South Wales; his home at Eccleston, where, recently, he died—suddenly.

John Hopson was a nature lover, interested in every form of life, but mainly in insects. He found many new species on Barrington Tops, and several were named after him. But, among naturalists who have visited the wonderland of the Mount Royal Range, he will be remembered for his gift of friendship. His eyes revealed his qualities. He liked a pleasant joke; and had that cheerful view of life, allied to the kindest nature, which marks the best companion a man could wish for, in journeys to Nature.

I went to Eccleston, a stranger. John Hopson, with only a mutual friend's introduction, welcomed me, as he has welcomed many another naturalist. We were friends on the instant. And during our days together on the lonely Barrington Tops, our rambles and talks by the fireside in the old hut, John Hopson was revealed as a man whose friendship honored those to whom he gave it. A farmer, with the love of nature in his heart, he explored in boyhood the region with which his name must always be associated. A splendid bushman, he was, too; careless of tracks when a short cut meant saving the horses; though it was easy to become lost on the Tops, where the mist may roll over the plateau swiftly as a racing tide covers an island reef of the Great Barrier. One day, a mile from the hut, the mist caught us. It was so dense that a yard away my companion was barely visible. Yet, without compass, he led the way back to the little grey shack—our home in the Land of the Mist.

Men like John Hopson are rare enough always; they are becoming rarer. He read all the pages of Nature's book that a man might turn without far wanderings. He knew his district and Barrington Tops as Gilbert White knew Selborne. And had the farmer naturalist been an author, we should be richer than we are in knowledge of nature's ways, where mist and sunshine mingle through more than half the year.—CHARLES BARRETT.

STUDIES OF AUSTRALIAN BEES.

BY TARLTON RAYMENT.

I.—THE LEAF-CUTTING BEES.

(*Megachile macularis*, Dalla Torre, and other species).

The Great War did not pass over my family without leaving its imprint. The anxiety over the safety of those abroad, the grief of stricken relatives at home, the financial losses—all were surfeited with life in a little, old, ramshackle cottage that had but one redeeming feature: around its portals, and straying, unkempt, far over the roof, were the rich masses of a golden-flowered Bank-sian rose. The name I shall never forget, it was the "Seven Sisters," but that is quite immaterial, for the bonds that chained us to that modest abode were the golden lengths of bloom. This prodigality of wealth on the exterior compensated for the poverty of the drab inside.

The world regained its sanity and returned to work. Once more I could plan and devise. At length, fortune smiled, and my pencil mapped out a dream-house on paper. The ideal developed into the material, and soon pegs were driven in and workmen were busy pouring concrete into wooden moulds; forming walls to withstand the crumbling grasp of Time.

I can hear some impatient reader exclaiming:—"What on earth has his house got to do with the leaf-cutting bees?"

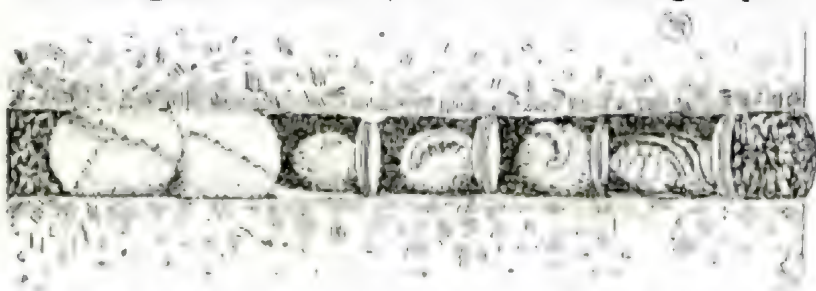
It has everything to do with the subject, for in the building of my habitation a most unexpected provision was made to accommodate thousands of bees and wasps. Why, one cannot find leaf-cutters' nests every year, but in my house I had hundreds of nests each week. Think of it, dozens of leafy cells right at my hand any hour of the day.

Well, you should know that the wooden formes on the exterior and interior of the walls were held together with double-ended iron bolts, having a diameter of $\frac{3}{8}$ of an inch. Prior to insertion, these were greased to prevent the adhering of cement, and, after the concrete had hardened, they were withdrawn. The walls, then, were pierced in hundreds of places with $\frac{3}{8}$ in. holes. When the finishing, white plaster was applied to the inside, that resulted in the closing of the far end of the hole.

The rough, unfinished exterior had a suggestion of the antique that satisfied my sense of beauty, consequently, the outside was untouched for a year or two. But I had observed that many tenants had already taken up their quarters in my walls. True, the "passers by" laughed at my high-pitched, red-tile roof overhanging the solid, unfinished grey of the concrete; but I desired to study bees, not my fellow-creatures.

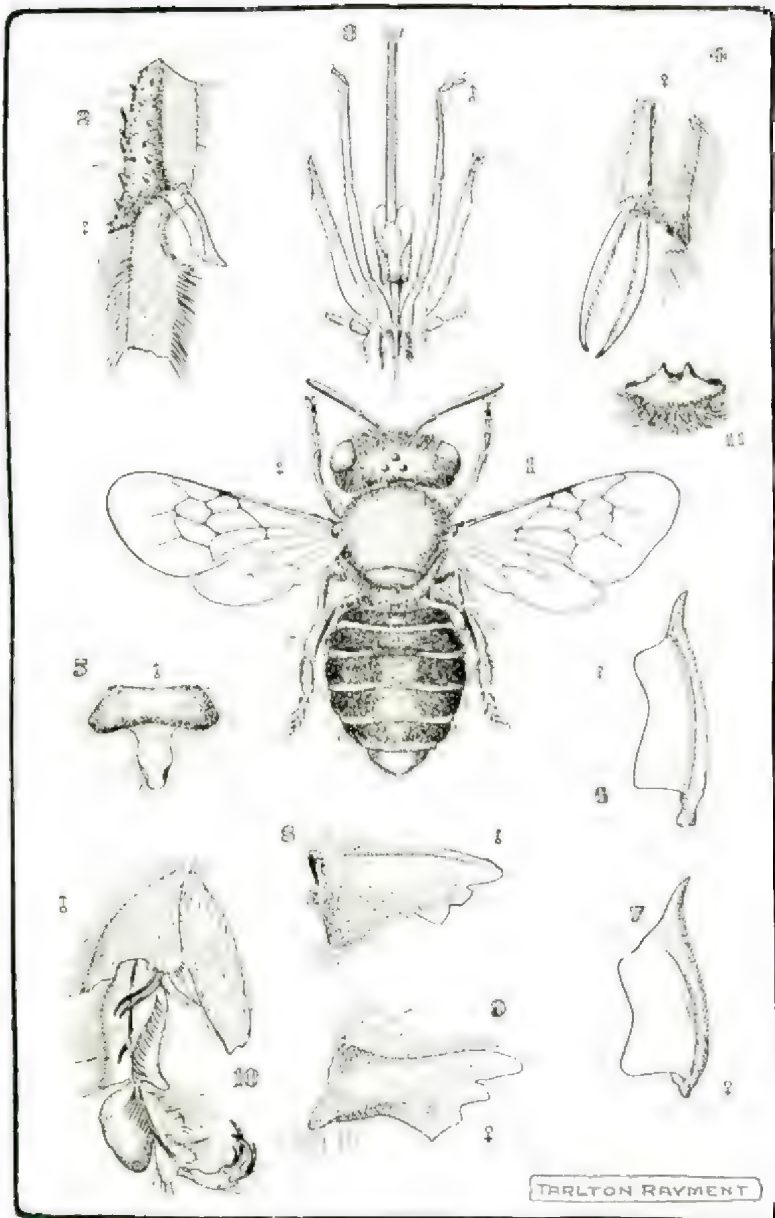
In the newly-formed garden roses, lilac, and cherry-trees were planted, to relieve the bareness of the great mole, of which my house was the crown. First, the young leaves of the roses were mutilated by a series of circular cuts, then the lilacs suffered, and even the cherry and *Robinia* trees were laid under tribute. But I did not mind the petty damage; indeed, I found it a source of great entertainment.

My little vandal is slightly smaller than the hive-bee, and though dark in colour, she has six small light spots



An Australian Leaf-cutter's (*Megachile victoriae*) nest, built in the concrete wall of the author's home. Note the barrier of leaf debris at each end.

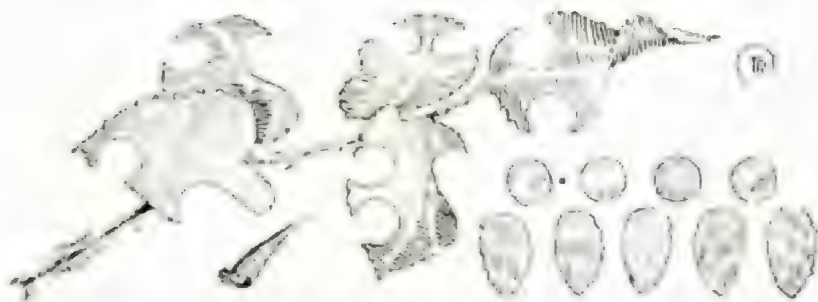
on her thorax, and five narrow, pale bands on her abdomen; the belly *scopa* is of a rich, yellow tint. She is a shy creature, refusing to work at her trade under the gaze of the curious. She swoops down over a rose-leaf, hovers for a second and alights. At once she snips off a piece of no particular shape, and grasping it safely in her jaws, with the flap end against her chest, she wings back to her stony cavern. These rough, first cuttings are tossed in higgly-piggly order at the back of the tube, a mere packing, and nothing more. The bee is no sooner out of sight with her remnant than she reappears at the mouth of the tube, and darts away for another piece of foliage. No time is spent in arranging these fragments, there is no need, since they are merely a soft insulation.



I. Details of *Megachile Chrysopyga* and *M. Suffusipennis*.

How many pieces of leaves are required to satisfy these bees? Permit me to consult the masters in other countries, so that I may have a standard for comparison. Fabre, the "inimitable observer," says his French *Megachile* gathered one thousand and sixty-four pieces of leaves for the construction of her seventeen cells; a prodigious labour for the indefatigable mother. The American, Putnam, observing *M. gemula*, Ckll, found thirty cells, in nine rows, contained over one thousand pieces. Reed, another American, records a nest of *M. brevis*, Say, which was built in a curled plum-leaf, but he does not give the number of the component parts. Horne, in India, saw *M. fasciculata* working in pairs, and building cells as large as a woman's thimble, and thought that thirty or forty cradles were made by the two parents.

Well, I did not find more than six or seven cells in the



Rose leaf cut by an Australian Leaf-cutter Bee, *Megachile ferox*. The curled piece was taken from the barrier at front of cells. The circles are the divisions between the cells and the pear-shaped ones, constitute the lining of the walls.

series made by my Australian leaf-cutter, and the remnant pieces numbered about fifteen or twenty. It was a very easy matter to remove the packing, for I simply held a paper screw beneath the entrance, and blew softly until the whole number of pieces came out. To secure the nests intact, so that I could count the wads," I adopted the trick of lining out the holes with paper tubes, a very serviceable method. The leaf debris soon dries, and each piece curls into a spiral, more often than not locking itself into the adjacent remnants.

The requisite amount of packing, or insulation—whichever you please—being in position, the bee altered her design and snipped out small discs, each of which had a diameter of $\frac{3}{8}$ of an inch; three of these are tamped

home, against the packing, like wads in a gunbarrel. Once more the design is varied, and elliptical forms are excised from my rose-leaves to form the lining of the sides. There is always one side with the natural serrations of the leaf and the cut smooth edge of the other side-piece is deftly interlaced.

What plants do the bees of other countries favour? Again I beg of you to let me quote the words of other observers:—*M. anthracina*, in India, makes eight or so cells from the Pigeon-pea (*Cajanus indicus*); in France, *M. albocincta* favours the Hawthorn (*Crataegus oxyacantha*) and *Cistus albidus*; in Britain, *M. argentata* uses the Trefoil of the fields, *Lotus corniculatus*. Fabre includes the Quince, Capsicum, Vine, Bramble, Pomegranate, Sage, and even his garden *Pelargonium* flowers. Why enumerate more; here is sufficient to show her cosmopolitan tastes.

My Australian leaf-cutter worked on the nectar and pollen of the Bramble, and also the minute flowers of a *Melilotus* that I obtained from America. At Ringwood, near Melbourne, I find her on the Black Tea-tree. She did not disdain the flowers of the Red-gum tree (*E. tereticornis*), and searched the yellow heads of the Flat-weed (*Hypochaeris radicata*). Her menu is as varied as is her choice of building material. *M. brevis*, in America, favours the *Peritoma serrulatum*, and other species; *M. campanulae* confines herself to the Bell-flower (*Campanula americana*). In India, *M. proxima* loves the nectar of *Clitoria*, but for industry in fertilization, I beg to refer you to another American species, *M. latimanus*, which has been observed to pollinate in one hour 552 blossoms of the Sweet Pea *Lathyrus odoratus*.

I emerge from that botanical catalogue with great relief, and return to the further details of the Australian nest. The pudding, I say, is a stiff mixture of honey and pollen, and on that rich provision the egg is laid; no, I err, the bees stands the egg on end with greater skill and less damage than Columbus could demonstrate to his peers.

But why go on? each cell is a replica of the first one: wads, lining for the barrel, a pudding, an egg, more wads. At the entrance, there is more insulation, more packing, and closed in their leafy cradles, the babies gorge for a week or two. Some fairy wand wafts them into a deep sleep that lasts over the rigours of the winter, and in the increasing warmth of the following spring

the fully-grown children will emerge to life and love. That is the story of the leaf-cutters, and I might leave it here, but there is another phase that I did not touch.

It seems to me that the leaf-cutters are links joining other genera. One European tailor-bee of the genus *Osmia* cuts out cradle-gowns from Poppies, others use vegetable putty of their own manufacture. *Mcgachile lanata* makes mud cells like the *Lithurgi*, while *M. acuta* is a carpenter as well as leaf-cutter; another Indian species, *M. disjuncta*, Lepel, uses both mud and leaves. Mr. Henry Hacker, of the Queensland Museum, finds some correlation between the shape of the abdomen and the material chosen for the nests. Those species having a "straight lined" abdomen, work in clay, vegetable putty, or a crude waxy material, whereas the bees with wide "shovel-shaped" bodies are leaf-cutters.

A fact that is of great interest to me is the formation of the forelegs of the Male leaf-cutters: the curious tarsal processes seem to have some relationship to the "shovel-shaped" abdomen. However, I leave the question for the time being, since I cannot devote my life to the anatomy of a single family, the leaf-cutter bees of my walls.

II.—THE CLAY-BEES.

(*Lithurgus atratiformis*, Cockerell.)

Did I tell you that the western shore of Port Phillip Bay is low and wind-swept? Just so, it is as repellant as the eastern shore is attractive. There are but few trees, for the soil is a shallow, stiff, blue-black clay resulting from the decomposing of the surrounding "blue-stone." The sand-loving bees do not favour it; even the species that delight in the abandoned homes of others, have difficulty in finding suitable sites. In truth, it is an inhospitable country for honey-gatherers. In spring there is an abundance of the golden Capeweed, and later, in the heat, when the plains glimmer in the intensity of the summer sun, there are Thistles to deck the fields.

I felt like the boys of the Grammar School:—"Sir, where shall we look for bees?" I had a conviction that those treeless flats afforded little food and less shelter, except for a few burrowing bees that prospered during the fugitive harvest of the spring: frankly, I spend but little time in the uninviting land that shows as a faint, low line on the other side of the bay.

I have a young naturalist friend, who knows the western shore much better than I do, and he delights in

searching for moth pupae in the great grass-tussocks of the plains. When the prevailing wind lashes the land, moths and butterflies seek the shelter of a long fence enclosing the storage magazines for explosives. In every crevice the brown Bogong moths mass in hundreds, glad to escape from the torment of the salt wind. My friend finds his quarry sheltering there. His quick eye perceives other life, such as spiders, thrips, longicorn beetles, and many smaller creatures.

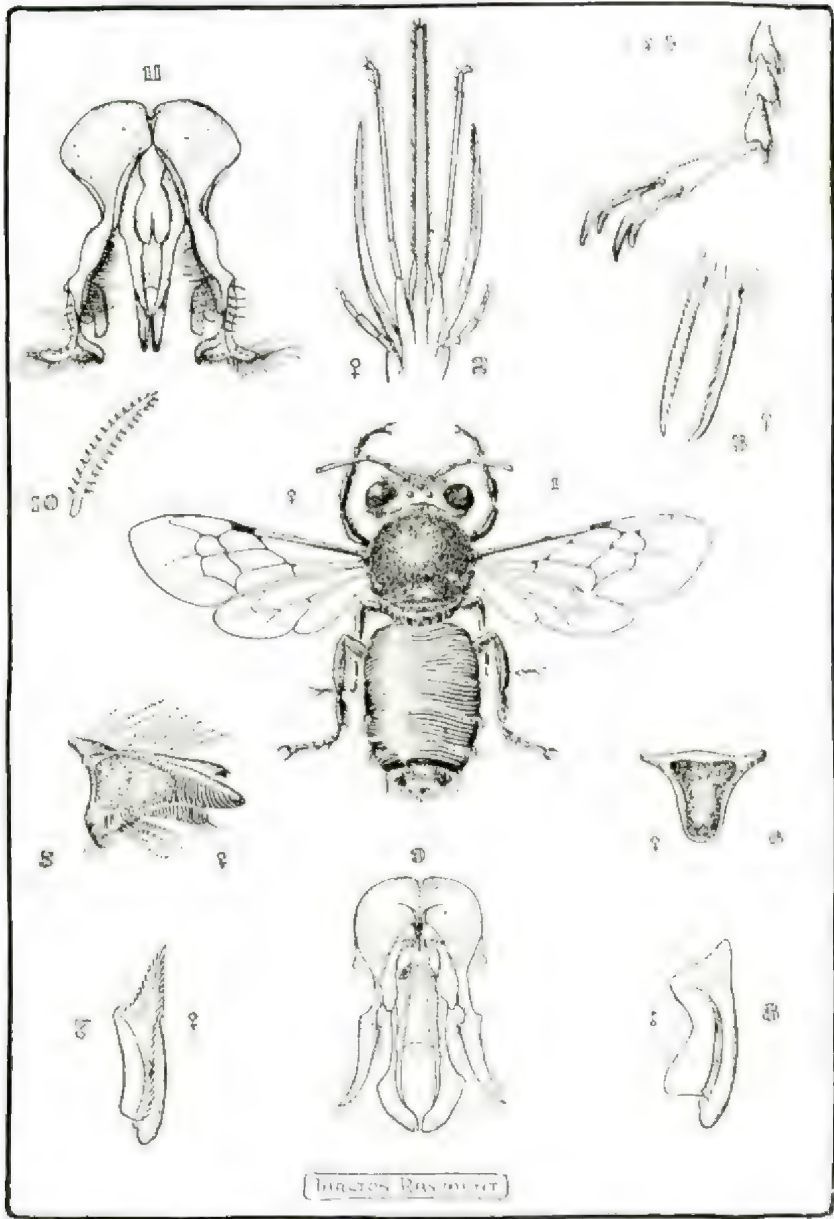
One side of the fence enclosing the quadrangle faces north, and, while hiding from the wind, yet it receives the full warmth of the sun. In the tall, hard-wood pickets there are small chambers, originally, the work of the forest beetles, but in their present situation these short tunnels are occupied by spiders and clay-bees.

You will be surprised, I know I was, to learn that this bee, with the name "stone-worker," is a moulder of clay. A miserable worker, it is true, but a potter, beyond all doubt. Long ago I wanted to tell a fellow-naturalist about one of these potter-bees, and he, a good-natured fellow, invited me to look over his collection of insect earthenware. Each fragile piece was the work of some small craftsman, and among that array of nature's art a few miniature urns rivetted my attention, for they were bijou examples of great beauty. No vase from the wheel of the human potter could be more delicately designed or more gracefully fashioned. I say that no glaze of lead or other rude mordant could rival the exquisite finish of that ware; it was porcelain from the hand of the Greatest of Potters.

But my friend is dead now, and no longer will his hands fondle the masterpieces of the insect world. He told me the vases came from abroad, the tropics, where a large *Lithurgus* has access to a stratum of white china clay. How I should like to have these urns! But the pots are not to be found. Perhaps my old friend had them only on loan. Who knows?

So, you see, I had in my mind a picture of urns of elegant workmanship. I have longed for the day when I would uncover the nest of an Australian *Lithurgus*, and hold in my hands the lovely miniatures. Will they be white or brown? Smooth or rough? Dull or brightly glazed?

My young friend, I say, has taken me to the tunnels of the longicorns in the hardwood fence, at Altona, on the western shore. In the homes are *Lithurgi*, or clay-bees.



II. Details of *Lithurgus Atratiformis*.

He caught one, but I was disappointed—no, that is not the right word, I was astonished at the primitive nests. I found a mere dry bluish mud lining in the galleries. The cell-divisions were of the same material, and the stopper at the entrance just as crude. Not a vestige of any modelling; not a trace of any design.

I am amazed at the simplicity of it all. I recall the simple, unlined, earthen tunnel of the Australian *Halic-tus*, and contrast it with the exquisite porcelain of a French species; I see a like great gulf separating the work of this native bee from the artistic labour of its congeners overseas. I am pondering over the crude character of the work of so many Australian bees. Oh, so elemental, so unskilled.

I do not know the generations of the *Lithurgus*. The bees were caught coming out of the nesting chambers on "All Fools Day."

The chambers are too shallow to hold more than a couple of cells; but were the surroundings more congenial, affording better home-sites, then the nest might be larger. These bees are within the *Megachilidae* (the leaf-cutters' family), and the number of cells in more extensive premises might reach six or so. It is a point I shall determine in the coming summer.

I have prepared a block of dry hardwood, bored to provide a series of chambers, some of which have a diameter of 5 mm., while others are of larger size. In such a desolate country the *Lithurgi* may be glad to avail themselves of the safety and shelter thus easily provided. It seems that in the absence of other home-sites the bees are simply driven to nest in the fence, which is the only available protection. To make the holes more attractive for the bees, I shall line them with paper tubes, which are easily withdrawn for observation when the cells are completed.

The locality is a good one for the test, because human habitations are likewise few and far between; moreover, the proximity of many tons of stored high explosives is not conducive to human gatherings, and I will be left in peace. I shall tell you the result at some future time.

Dr. R. J. Tillyard says in his book, *Insects of Australia and New Zealand* the *Lithurgi* are parasitic on other bees; but I know otherwise; and I again draw your attention to the crude industry of this Australian species, and the superior pottery-ware of its congeners overseas.

Mr. Henry Hacker, of the Queensland Museum, finds both sexes of *L. atratiformis* on Stradbroke Island fre-

quenting the flowers of *Ipomaea* during December. But the bees are not common, and prior to our observations at Altona, nothing at all had been recorded of their habits, nor did I expect to find the *Lithurgus* on the wind swept shores of Port Phillip.

KEY TO PLATES.

I.—DIVISION MEGACHILIFORMES.

Family, MEGACHILIDAE. Sub-family, MEGACHILINAE.

Genus, MEGACHILE, Latr.

- I. Adult female of *M. chrysopyga*, Smith: Note the inconspicuous pterostigma.
- II. Antenna-cleaner of female *M. suffusipennis*, Ckll. The spinose outer surface of the tibia is not unlike that of *Euryglossa*.
- III. The long tongue of female *M. chrysopyga*.
- IV. Calcariae or tibial spurs of female *M. suffusipennis*.
- V. Labrum or lip of male *M. chrysopyga*.
- VI. Antenna-cleaner of female *M. suffusipennis*.
- VII. Antenna-cleaner of female *M. chrysopyga*; Note the indent in the hyaline velum.
- VIII. Mandible or jaw of male *M. chrysopyga*.
- IX. Mandible of female *M. chrysopyga*.
- X. Flattened tarsal processes of male *M. chrysopyga*.
- XI. Rear view of seventh ventral plate of male *M. chrysopyga*: Note the two nodules.

Nota bene: See Plate II. (*Lithurgus*) for drawing of genitalia.

II.—GENUS LITHURGUS, Latr.

- I. Adult female of *L. atratiformis*, Ckll.
- II. Glossa or tongue with labial and maxillary palpi.
- III. Tibial spurs of female.
- IV. Four of the tarsal joints: note the long claw-joint. The claws are drawn too long.
- V. Mandible or jaw of female, with its peculiar vestiture of plumose hair.
- VI. Labrum or lip of female.
- VII. Antenna-cleaner of female: Note the narrow, indented velum and serrations of malus.
- VIII. Antenna-cleaner of male: Note the smooth malus.
- IX. Genitalia of *L. atratiformis*, Ckll.
- X. A hair from the tibia showing the exceedingly thick shaft.
- XI. Genitalia of *Megachile macularis*, Dal. Torr.

ETHNOLOGICAL SECTION.

A meeting of the Ethnological Section of the Club was held at the Royal Society's Hall, on Thursday evening, June 7th. Mr. A. S. Kenyon presided. Formal business was transacted, and it was agreed to meet on a suitable evening in the week after the monthly Club meeting, thus ensuring more publicity as to the meeting of the section, and the subjects arranged therewith. Mr. Chas. Daley was appointed Hon. Sec. of the section. It was decided to arrange for a sectional item on the next Club syllabus, with brief lectures, illustrated by specimens. Dr. S. Pern gave a lecture on "Boomerangs," dealing with their origin, the different types, manner of construction, and material used, the principle of the flight, and the use of boomerangs in sport, play, and warfare. A fine series of specimens was shown.

SOME ADDITIONS TO THE FISH FAUNA OF VICTORIA.

No. VI.

BY JAS. A. KERSHAW, C.M.Z.S., Curator, National
Museum, Melbourne.

TETRAODON FIRMAMENTUM, Schlegel.

The Starry Toado.

By an unusual coincidence, two specimens of this fish were received by the National Museum, from different sources, within half an hour of each other. One, the largest, was found in a box of fish at the Melbourne fish-market, and forwarded to the Museum, through the courtesy of Mr. F. Lewis, Chief Inspector of Fisheries and Game. It was obtained in Port Phillip, near the mouth of the Werribee River, by Mr. A. W. Burton. The second specimen was found washed up on the beach near Frankston.

The largest specimen measures 405 mm., exclusive of



the caudal, which is 92 mm. The skin is smooth, and the whole surface beset with minute spinules projecting just beyond the skin. They are less numerous on the snout and on the caudal peduncle. At the base of each spinule is a minute, swollen, pure-white tubercle, or papilla, which does not quite encircle the spine, the extreme tip of which is exposed. They are conspicuous over the whole dorsal area, but less noticeable on the white under-surface.

The whole of the head, back, sides, and caudal peduncle is of a greyish-brown colour, darkest on the dorsal area, and is spotted all over with small, round, pale-blue spots, a few of which extend on to the caudal. The throat and

under-surface is chalky-white. Fins a little darker than the body.

The smaller specimen measures 330 mm., exclusive of the caudal, and is otherwise similar in all respects to the larger one.

This is a deep-water species, originally described from Japanese waters. Although recorded from New South Wales, it does not appear to have been previously found so far south.

TRUE TO NATURE.

The average mounted snake skin in our museums, in fact, in the museums of the world, with a few very modern exceptions, is not an outstandingly "true to nature" exhibit. In most cases, it has an entire lack of form, resembling nothing so much as a well-filled sausage. Sometimes it is dry, brown and shrivelled looking; sometimes it is obviously coloured with opaque paints on top of the scales. In either case the soft appearance of the live reptile is destroyed, for a live snake has the colour pigment underneath the scales. Not much better are the casts of snakes seen in some of our museum galleries, for the same objection as to colour is evident, while the casts themselves are of dead snakes, posed to look like life. After death, however, the muscles of any snake sag and become flabby, and are therefore useless for casting as a representation of a live reptile.

Recently, a new method has been evolved in which a great improvement in both form and colour, is obtained. While probably differing in detail from the following, the basic idea comes from America, where taxidermy probably is further advanced than in any other country, and where large sums are spent on the upkeep of museums.

The preparator must handle live snakes. The reptile to be "cast" is given a whiff of ether or chloroform until it becomes literally unconscious, and is kept in that state by an ether-saturated pad of absorbent wool, held over the head with a rubber finger stole, or similar device. The whole of the body to within a few inches of the head is covered with plaster of Paris, which quickly sets. A strong dose of chloroform then kills the snake, when the head is posed and the mould completed. The mould is filled, and the result is a cast of complete fidelity, the muscular curves and contours being absolutely true to life.

The next difficulty to be overcome is that in snake skins which are not treated to counteract it, the scales shrink and lose their colour and plumpness in drying. This is avoided by giving the skin a special preserving bath containing, among other things, glycerine, which plumps the scales and leaves them permanently soft and flexible. Thus we have a plump and semi-transparent skin on which the colours may be painted on the inside, so that the pigment is actually under the scales. Only the brightest of tones require to be sparingly touched with opaque colour. This specially preserved skin is fitted to the cast obtained from the live snake, and the result is a much more life-like representation that can be obtained by any other method.

A carpet snake exhibit, prepared in the manner described at the National Museum, has recently been placed on view in that institution.

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August 7, 1928.

No. 536.

THE FIELD NATURALISTS' CLUB OF VICTORIA.

The ordinary monthly meeting of the Club was held in the Royal Society's Hall, Victoria-street, Melbourne, on Monday, 9th July, 1928. The President, Mr. F. E. Wilson, F.E.S., occupied the chair, and there were about 120 members and visitors present.

CORRESPONDENCE.

From relatives of late Mr. Dudley Best, and family of late Sir Aaron Danks, thanking members for expressions of sympathy.

From Sir Edgeworth David, acknowledging congratulations of members in connection with his recent palaeontological discoveries.

From Victorian Horticultural Society, assuring the Club of their support in any action that may be taken to combat the wanton destruction of native flora in the State.

From Town Planning Association, asking the Club to appoint representatives to a deputation to the Chief Secretary for the purpose of urging that an area of 75 acres of land near Healesville, formerly occupied by the Australian Museum of National Zoology, be created a permanent reservation.

From Government Tourist Bureau, notifying that arrangements were being made for special Nature Study Camps at Mt. William (Grampians) from 8th to 15th and 15th to 22nd September next, and inviting applications from members for inclusion in the parties.

Mr. G. Coghill moved that the Club strongly support the proposal for the permanent reservation of the area of land near Healesville. The motion was seconded by Mr. F. G. A. Barnard, and carried unanimously. The President announced that arrangements had been made for Mr. E. E. Pescott and himself to represent the Club on the deputation to the Chief Secretary.

Mr. A. L. Scott moved that the Tourist Bureau be written to and complimented on their action in organising Nature Study Camps at the Grampians. Mr. J. W. Audas seconded the motion, which was carried.

REPORTS.

A report of the excursion to the National Museum on 16th June was given by Mr. F. E. Wilson, F.E.S.

ELECTION OF MEMBERS.

The following were duly elected on a show of hands:—As ordinary members:—Miss M. E. Keartland, 66 Gipps-street, East Melbourne; Dr. Chas. Sutherland, 203 Williams'-road, Hawksburn; and Mr. A. J. Swaby, 52 Littlewood-street, Hampton. As country member:—Mr. R. W. Miles, State School, Heyfield; and as Associate member:—Master Selwyn Chidgey, 8 Bendigo-street, Hampton.

GENERAL.

The President referred to the loss recently sustained by Miss R. S. Chisholm, B.A., in the death of her father, and the Hon. Secretary was requested to write a letter of condolence to Miss Chisholm.

The Hon. Secretary read a motion, notice of which had been given at the June meeting by Mr. E. E. Pescott, F.L.S., on behalf of the Committee, as follows:—"That Mr. William Lawford, of Benalla, be elected a Life Member of the Club, in view of his valuable gift of a full set of Mathew's "Birds of Australia," for the Club library. The motion was seconded by Mr. F. Pitcher, and carried unanimously.

The President announced that Mr. V. H. Miller had generously donated a supply of envelopes for posting the *Victorian Naturalist* sufficient to last for two years, and, on the motion of Mr. F. G. A. Barnard, seconded by Mr. J. H. Harvey, the thanks of the Club were conveyed to Mr. Miller.

LECTURETTE.

An interesting lecturette was delivered by Dr. Sydney Pern, dealing with the varied bird and animal life of the islands of the Great Barrier Reef. Dr. Pern's remarks were illustrated by a cinematograph film depicting many phases and incidents of natural history interest during his sojourn in the locality. The lecturette was followed with close interest, and a vote of thanks accorded to Dr. Pern at its conclusion.

EXHIBITS.

By Mr. H. B. Williamson, F.L.S.—Dried specimens of six species of *Liliaceæ*, illustrating Part V. of "The Lilies of Victoria," in the *July Naturalist*.

By Mr. F. Pitcher.—Bifurcated frond of *Alsophila excelsa* (Lofty Tree Fern) from plant growing in his garden at South Yarra.

By Mr. C. J. Gabriel.—Marine Mollusca from Barrier Reef, off Cooktown, including *Zenophora solarioides*, Reeve; *Cypraea quadrimaculata*, Gray; *C. eribraria*, Linn; *C. talpa*, Linn.; *C. arabica*, Linn.; *C. vitellus*, Linn.; *Conus capitaneus*, Linn.; *C. nussatella*, Linn.; *C. textile*, Linn.; and *Spondylus nicobaricus*, Chem.

By Mr. F. E. Wilson, F.E.S.—Eight species of beetles belonging to the family *Carabidae*, viz.—*Silphomorpha suturalis*, Germ.; *S. bimaculata* cast, *S. vicina* cast, *S. speciosa*, Pasc.; *S. nitiduloides*, Guer.; *Adelotopus scolytides*, Newm.; *A. ipsoides*, Westw., and *A. castaneus* cast.

By Mr. J. Searle.—Specimens of *Chactognatha*—*Sagitta*, *Spadella* and *Knolmia* (several species). Mollusca—*Argonauta*, sp. embryos. Crustacea—*Caprella*, sp. and larva of Mantis shrimp, *Squilla* sp. Pisces—Young Pipe-fish. Urochordata—*Appendicularia*. All from Port Phillip Bay.

By Mr. W. H. Nicholls.—Water-color paintings of Victorian and New South Wales orchids—*Pterostylis grandiflora*, Br.; *P. acuminata*, Br.; *P. cucullata*, Br.; *Caladenia reticulata*, Fitz.; *Calceana minor*, Br.; *Leptocria fimbriata*, Lindley; *Corysanthes diemenica*, Lindley; *Calochilus imberbis*, Rogers; *Lyperanthus ellipticus* and *Thelymitra Macmillanii*, F.v.M.

By Miss A. Paterson.—Specimen of *Corysanthes dilatata* (Rupp and Nicholls), from timber-track to Mt. Donna Buang, approximately 1000 feet above Warburton.

By Mr. Geo. Coghill.—Garden-grown specimens of *Grevillea rosmarinifolia* and *Acacia podalyrifolia*.

By Mr. D. J. Paton.—Specimen of *Banksia collina* (Hill Banksia) from Moe.

By Dr. Sydney Pern.—Skull of Turtle from Barrier Reef.

By Mr. H. McColl.—Two sprays of the common Lilly-pilly (*Eugenia Smithii*), grown under cultivation at Kew, showing marked difference in habit of growth and color, one being white and in the form of compact bunches like grapes, and the other purple, and occurring sparsely scattered among the foliage. Also specimens of *Eucalyptus torquata* and *Hardenbergia monophylla*, vars. *alba* and *rosea*.

Part IV.

THE LILIES OF VICTORIA.

By H. B. WILLIAMSON, F.L.S.

Genus THYSANOTUS (Fringe Lilies).

Distinguished from the last six genera by having filaments and anthers without hairs or other appendages. Sepals and petals about equal in length, with an opaque, 3-nerved centre, the sepals usually narrower; petals with broad, coloured membranous margins rolled inwards over the inner stamens when in bud, and elegantly fringed on the edges.

- | | | |
|----|---|----------------------|
| | Stems twining | <i>T. Patersonii</i> |
| | Stems erect | 2 |
| 2. | Roots tuberous | 3 |
| | Roots without tubers, branches often forked | |
| 3. | Bracts few, stem well branched | <i>T. tuberosus</i> |
| | Bracts many together, white, broad; stems scarcely branched | <i>T. Baueri</i> |
| | | <i>T. dichotomus</i> |

THYSANOTUS PATERSONII R.Br. Twining Fringe-lily.

Fig. 1.

Small twining plant, with tuberous roots, flexuose, wiry stems and a few thready, radical leaves withering early; stem leaves reduced to small linear scales under branch junctions; flowers small, usually solitary and terminal on the branchlets, violet, with two small bracts a little below. Petals long-fringed; filaments thin and smooth, nearly as long as the anthers. Found in all parts of the State, and in all States but Queensland.

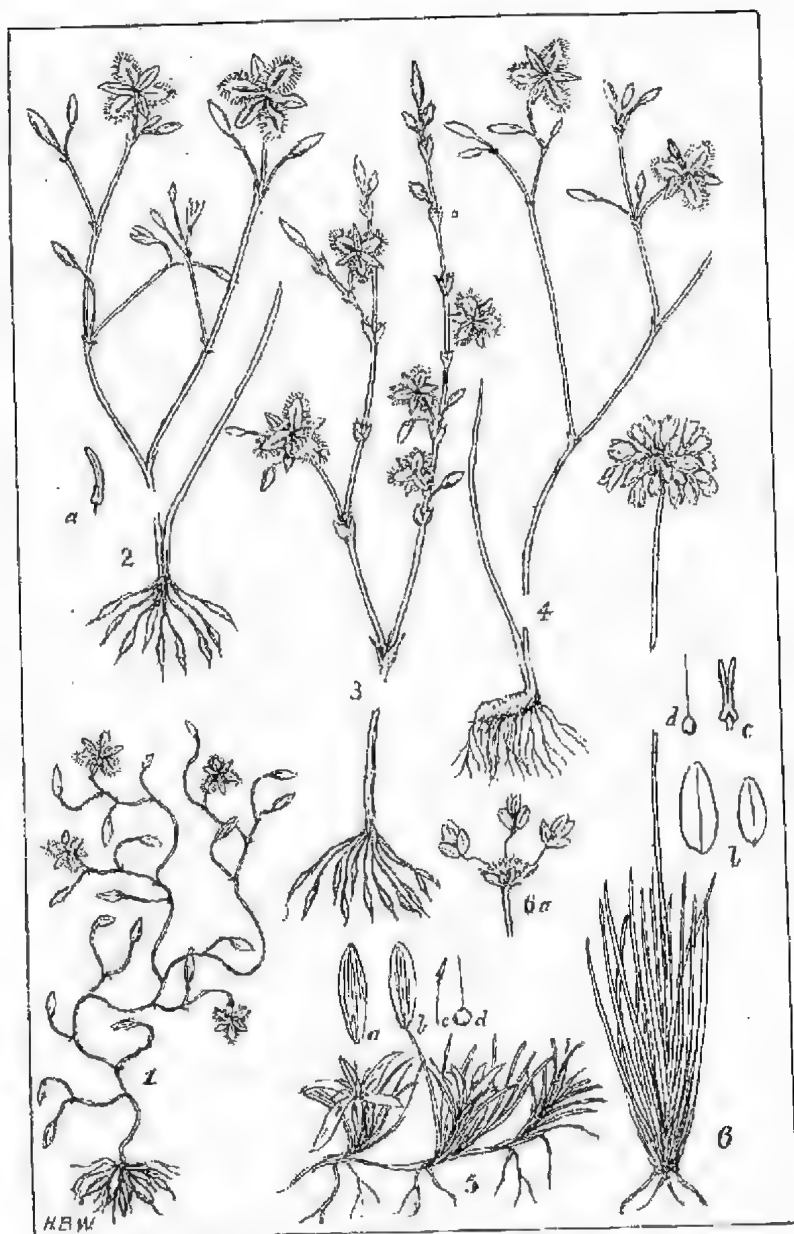
THYSANOTUS TUBEROSUS R.Br. Common Fringe-lily.

Fig. 2.

Roots tuberous, leaves basal, few, long and narrow; scape erect, up to 1 foot high, each branch terminating in an umbel of 1-2 flowers, with sometimes a second umbel on the branch lower down; flowers large, reddish purple, with broad deeply fringed margins; 3 stamens nearly as long as the petals, ending in a narrow beak, the 3 others shorter. Found in all parts of the State and in S.A.; N.S.W.; Q.

THYSANOTUS BAUERI R.Br. Mallee Fringe-lily. Fig. 3.

Roots tuberous; leaves basal, narrow, usually much shorter than the scape, but withering early so that the plant often appears to be leafless; scape to 1 foot high, slightly branched in the upper part along which flowers occur in umbels of two or three rising from a bunch of broad, white bracts. The number and nature of these bracts, as well as the scarcely branched scape, renders



1, 2, 3, 4, *Thysanotus*. 5, *Herpolirion*. 6, *Sowerbaea*.

this species easily distinguishable from *T. tuberosus*. Occurs only in the North-West of the State—Wimmera, Reader; Ouyen, H.B.W.; and in S.A.; N.S.W.: Q.
THYSANOTUS DICHOTOMUS (Labill.) R.Br. Branching

Fringe-lily, Fig. 4.

This much resembles *T. tuberosus*, but its roots are very different, being fibrous without any tubers. Stem and roots spring from a thick rhizome, which in old plants is horizontally extended. Umbels are terminal, with rarely more than two flowers, and the stems are rigid, terete, and usually forked. It has rarely been gathered in Victoria. Some of the records, e.g., Fullagar's, appear to be doubtful owing to the absence of roots. Glenelg River, Robertson; Little Desert, and Lowan Shire, Reader; between Jan Juc and Swampy Creek, Fullagar; Mt. Zero, Mueller. Robertson's specimens are not in our Herbarium. Occurs also in S.A. and W.A.

Genus *HERPOLIRION*.

HERPOLIRION NOVAE-ZELANDIAE Hk.f. Sky Lily.

Fig. 5.

A dwarf alpine stemless plant, with solitary flowers almost sessile within a tuft of leaves rising from a slender rhizome. Leaves linear, 1-2 inches long, with sheathing, imbricated bases; flowers white or bluish, with 5-nerved petals and sepals about $\frac{1}{2}$ inch long, spreading from a little below the middle; anthers shortly sagittate at the base, on long filaments. Common on springy ground on the Baw Baws and Alps, to 5,000 feet. Occurs also in N.S.W.; Tas.; and New Zealand.

Genus *SOWERBAEA*.

SOWERBAEA JUNCSEA Smith, Rush Lily. Fig. 6.

A tufted perennial with fibrous roots, grass-like leaves, and flowers in dense umbels. Stems slender, 6 inches to nearly 2 feet high; leaves linear with scarious, sheathing, transparent bases; umbels many flowered; flowers on long thin pedicels rising from among numerous pointed bracts on a common receptacle. (6a. most of the flowers removed).

Sepals and petals (b.) pink, oval-oblong, scarious, about 3 lines long, the former rather shorter; stamens 6, only 3 of them bearing anthers; these are long, and are divided from above nearly to the cordate base (6c.). It is confined to Gippsland, the most western records being "Woodside" and "between Latrobe River and Merri-man's Creek," Mueller. Found also in N.S.W. and Q.

STUDIES OF AUSTRALIAN BEES.

BY TARLTON RAYMENT.

"BLOOD RED."

The Bees of the Genus *Euryglossina*, Ckll.

I am looking along a highway bordered with two rich bands of flaming crimson. The road winds, with the diminishing of perspective, until it merges into the cobalt-blue haze of Port Phillip Bay. There are, I say, in summer, two gorgeous lines of red that are as unforgettable as the crimson of living blood. Travellers beholding the avenue for the first time are enraptured with its beauty. But I survey that glowing vista with a twinge that constricts my very soul. Why should that magnificence depress me? The gum trees are natives of the Australian bush, and the botanist has called them "beautiful leaved and red," or "*Calophylla rosea*." I hear the song of happy insects murmuring a melody of peace: I listen to the mellow notes of the nectar-sipping birds: it is all very beautiful, but I am sad.

A multitude of tiny yellow and black bees drone in the red blossom that luxuriates over the dark-green shining leaves. The bloom buries the foliage, I say. I pluck a twig, and the slight jarring brings down a shower of limpid sweetness. Why, I can fill a teaspoon from the overflowing treasury of the flowers. Ah, the unforgettable colour!

But what of the bees?

Sir, the minute creatures swarm round the nectar "urns," and joyously dust themselves in the creamy floral flour. Some are all clear yellow, others are banded and patched with black, a few are suffused with sable, but all have yellow legs and dark brown eyes. My mentor in taxonomy, Professor Cockerell, tells me that these tiny saffron creatures occupy a place in the Australian fauna corresponding to that filled by the bees of the genus *Perdita* in America. But the *Perdita* frequent only yellow flowers, whereas the Australian *Euryglossina* revel in the flood of the scarlet-gum.

The searching eye of the microscope reveals the extremely short, wide "tongue," the narrow lip fringed with hair; the pale, acute jaws; the toothed tibial spurs; the truncated *malus* of the antenna-cleaner; the narrow pale *pterostigma*; these are the signs by which one knows the *Euryglossina*; these are tokens that betray her affinity to the *Euryglossa*. I say that these lili-

putian honey-gatherers are related to the Cliff-bees of my shore.

I rejoice over the phenomenon: atoms of animal life are able to sweep into the mouth vegetable atoms, the pollen granules from the slender anthers. Yes, the virile dust is carried in the sac, mixed with the nectar, for the bees are almost devoid of hair. They have no "hallowed thigh" to bear the precious meal.

The teeth on the tibial spines tell me to look for the nests in earthen burrows. Is it possible for such small specks of life to excavate the cold, refractory soil. The four or so miserable wing-hooklets indicate weakness in the air. I compare them with the thirty or so strong *hamuli* of the bumble-bee, and ponder over the marvellous gradations in nature. I argue with myself: "Four hooklets must be a great limitation." Why, the nests may be close at hand; they may be right at the base of the tree: Who knows?

I lower my gaze from the scintillating crimson of the flowers, and am ready to excavate old "Mother Earth."

"Be still."

The command comes I know not whence. I halt under the avenue, a memorial to Australia's young soldiers who are sleeping far, far from their native land. I can no longer see the tiny bees, for I stand erect to bare my head before a name and a tiny cross moulded in imperishable bronze. Poor boy! *Requiescat in pace.*

ETHNOLOGICAL SECTION.

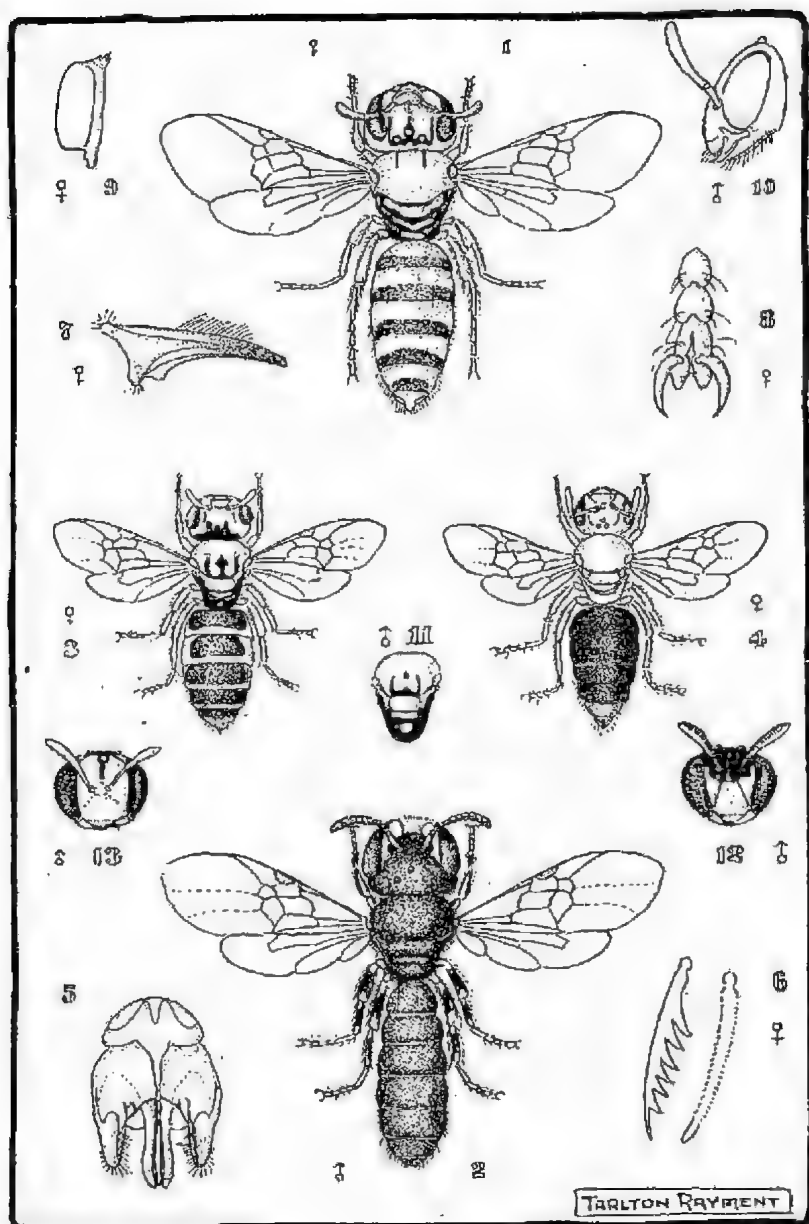
A meeting of the Prehistoric Club was held at the Royal Society's Hall on Tuesday, 17th July. The item on the syllabus was the Exhibition of Specimens, with comments by exhibitors.

Dr. Pern occupied the chair. After formal business, it was decided to have future meetings at Latham House, Swanston-street.

A varied and interesting series of exhibits was on view, the objects being described by Dr. Pern, Messrs. Gill, Kershaw, Miller, Daley, and Miss Kenyon.

An informative discussion ensued. The next meeting was arranged for Tuesday, 21st August, at Latham House, 2nd floor, 234 Swanston-street. Members of the Field Naturalists' Club are always welcome to attend.

Dr. Pern will treat with the subject, "The Early History of Man." Discussion is invited.



A NEW PROSPOID BEE.

BY TARLTON RAYMENT.

Euryglossa wilsoni, sp.n.

TYPE Male—Length about 4.5 mm. Head large, wider than the mesonotum; laterally roughly oval. Clypeus long and of yellow colour. Labrum narrow, yellow. Supraclypeal area with a carina rising half-way to median ocellus. Vertex black. Lateral face marks yellow, extending upwards to level of base of scape, and contracted at apex, the whole mark resembling a thumb. Frons well-punctured, Mandibulae yellow with reddish tips. Genae black, with a yellow spot near bases of Mandibulae. Antennae yellow beneath, suffused with black above; joints as wide as long, scape slightly dilated. Prothorax with two minute yellow spots. Tubercles yellow. Mesothorax black, microscopically tessellate, with fine, evenly distributed punctures. Scutellum and Post Scutellum black. Area of metathorax with a tessellate pattern bounded by a fine rim. Abdominal segments finely punctured, suffused with black, hind margins narrowly and obscurely lighter. Legs yellow, with long black patches on hind and median tibiae and femora, and anterior femora. Hind tarsi dark amber. Tegulae dark castaneous. Wings hyaline, strongly iridescent. Pterostigma large, dark amber, but in a certain light distinctly purple. Nervures dark amber. Radial cell large; basal nervure strongly arched, and just fails to reach the nervulus. Genitalia of Prosopoid type. The species seem to intergrade with *Euryglossina* and *Pachyprosopis*. It is dedicated to Mr. E. Wilson, the President of the Victorian Field Naturalists' Club, who captured it on a Shirley Poppy, on the 7th day of February, 1928, at Melbourne, and has the type-specimen in his possession.

KEY TO PLATE.

1. Adult female *Euryglossa furcifera*, Kkll.
2. Adult male *Euryglossa wilsoni*, sp.n.
3. Adult female *Euryglossina purnongensis*, sp.n.
4. Adult female *Euryglossina bicolor*, sp.n.
5. Genitalia of *E. wilsoni*.
6. Calcarinae of *E. furcifera*.
7. Mandible or jaw of female *E. furcifera*.
8. Three tarsal joints and claws of female.
9. Antenna-cleaner of female; note short malus.
10. Lateral view of head of male *E. wilsoni*.
11. Thorax of male *Euryglossina purnongensis*.
12. Front view of head of male *E. wilsoni*.
13. Head of male *E. purnongensis*.

AUSTRALIAN BOOMERANGS AND THEIR FLIGHT.

BY DR. SYDNEY PERN.

We have good reason to assume that a great period of time took place in the evolution of the boomerang. By gradually improving on the shape of a piece of wood, primitive man was able to increase the range of his missile from 50 to 150 yards or more. This increased range of dealing death was of supreme importance to him, and one may be sure that a good deal of hard thinking was done to accomplish it. The end of all this striving after increased range resulted in a weapon slightly curved, rounded off on top, flat underneath, the throwing end slightly twisted, and both ends raised a little. When thrown, this boomerang has a slightly curved course, and before it falls curves sharply.

In throwing a non-return boomerang, there are two factors to be considered—one is the initial velocity, and the other is the amount of spin imparted to it, as the greater the spin the longer will it remain afloat in the air, and, incidentally, the great damage inflicted, as it is the rate of spin that is so damaging. This can easily break an arm or skull, even if the boomerang is only gradually floating towards you. Having learnt that rapidity of spin was a most desirable object to attain, primitive man turned his attention to increasing its amount. By throwing his boomerang on the ground at such an angle, and timing it to strike at a certain point of its spin, he increased that spin enormously. Another great advantage gained was that a much heavier boomerang could be used this way than by direct throwing, as a man has not the power to impart a great deal of spin to a heavy fighting boomerang. In the description of the flight of this early type of boomerang, I pointed out how it curled round towards the end of its flight. This action was no doubt noticed in some more than in others, and certain points in the construction of such boomerangs were noticed and improved upon until eventually a boomerang was made which completed the circle. I must here mention that it is an extremely difficult thing to make a wide angle boomerang which will return, and only very occasionally does one find a native one which will do so. It took me some years striving before I was able to attain that desired end. Roughly speaking, the angle of a boomerang has a good deal to do with its range of flight, providing the densities of the wood are the same. The

angles at which it is possible to make a return boomerang varies from 40 to 160 degrees. With such diversity of angles, one would imagine the structure of the boomerang would be different, and so it is; for instance, with the wide angle return boomerang, the centre is very little thicker than the rest of it, whilst with the other, more weight is left at the angle. All boomerangs coming from Western Australia have wide angles. The Southern or Victorian type approximate towards a right angle. The North Queensland between the two. To make a boomerang which will return, is comparatively simple, but to make one which is properly balanced and capable of performing beautiful flights is another matter. Although the return boomerang is used in various parts of Australia, the types vary as well as the methods of making them. There are four distinct ways that I am aware of. I will attempt to describe each. In all return boomerangs, there are two factors always evident, one is the propeller action to keep it afloat, and the other is the curve necessary to bring it round in a circle. This is clearly demonstrated in the Cross boomerang, which will be dealt with later on. If we take a piece of wood approximating to 120 degrees and about two inches wide, trim down the edges on the upper surface, leaving the under surface quite flat, now rub some oil or grease into it, heat it before the fire, and bend it slightly in the middle, so that when it is on a flat surface on a flat ground, both ends will be about a quarter inch off the ground, you will have a boomerang which may be a right or left handed one. Some of the best boomerangs in my possession were made in this way. It is possible to make one so well balanced that it is right or left handed. In making boomerangs this way, it may be necessary to round off the under surface of the convex edge if the wood is inclined to be thick. This method I have seen employed by a Coranderrk black. Another method used by the same blacks is, after greasing and heating it, to lay the boomerang on the ground on its flat surface, bend up the distal end, and put a twist in the proximal one. Here, conforming to the principle of the cross boomerang. The next type is often seen in boomerangs with an angle of about 100 degrees. At the angle they are much broader than elsewhere. The upper surface is rounded off as in the others, and the ends are cut away to represent the blades of a propeller. This was a very common type amongst the Lake Tyers blacks, the Coranderrk and Lake Tyers blacks being of different tribes. So far,

there is no difficulty in making these boomerangs. It is a matter of cutting the flanges just the right amount, or giving the right amount of bend. This experience soon teaches. It is a very different matter when one comes to the boomerangs with the wide angle, as are found in Western Australia. Of these, there are two kinds—a light one and a heavy one. The light ones are about 21 inches long, and the heavy 25. They are invariably of the same angle, 175 degrees, or corresponding arc of a circle. They are made of ironbark, and when right, are the most ideal boomerangs obtainable. By many they have been considered war, or non-return boomerangs, for the reason that only an occasional one will return. An extraordinary degree of accuracy is required in the making, and the margin of error is very small. All the original West Australian boomerangs were stone cut, and when one considers that they had no true surface to start with, it is a wonder they got one in a hundred correct. For weeks I have tried copying one most faithfully, and yet there was just that something in the balance which made all the difference between a good and a bad one. I have some toy boomerangs given me by the late Mr. Banfield, of Dunk Island, which came from the Cardwell district, south of Cairns. They are of various shapes, and amongst them is one made by crossing two pieces of reed. These cross boomerangs, when thrown at the right angle and height, will return, but have not the same liveliness of flight as have the others. Curiously enough, they will go equally as well with one or even two blades off, as long as they are at right angles to one another. This cross boomerang opens up the possibility of the return boomerang originating from this source. It is a curious fact that the cross boomerang has survived to amuse the children in this district. I have a large wooden cross boomerang from the north-east part of Central Australia, made by the Arunta tribe, who are quite different to the Cardwell blacks, and who do not know the return boomerang. This cross boomerang exemplifies the two principles of the return one. One piece is cut to represent the blades of a propeller, this maintains to keep it afloat in the horizontal position. The other is bent, which will cause it to make a circle in the perpendicular position. Yalma is its native name. There are other boomerangs worthy of note. The Lil-Lil, with a piece of wood at one end resembling a chopper, and the hooked boomerang. There are some very in-

genious ideas put forward as to the use of this hook, but when tested they are not convincing. Among the Murray River blacks there used to be a queer weapon called the Quirriang-an-num, 36 inches long. It was like a large boomerang with a big curve. It was used for close in fighting, and enabled a man to hit behind the guard of the others.

Among the Wonkongirru tribe of Central Australia is a special type of boomerang called the Murra-wirree, their average length is about 95 cm., and about 900 gms. in weight. They are somewhat flattened, and have the flanges cut as in the ordinary boomerang, but are used exclusively as clubs. The late Dr. Horne, who recently visited this tribe, told me that the Murra-wirree is carried stuck in the girdle of human hair behind their backs, and that after using their throwing boomerangs, they seize the Murra-wirree by passing their hand over their shoulder and bring it down with a smashing blow upon their antagonist. Then it is held and used as was the old quarter-staff. Space will not permit me to give a detailed description of the different flights of the boomerang, and how to throw it, but in as brief a way as possible, I will try and describe the main points. The evolutions which a boomerang is capable of are bewildering, and at first it seems that there could be no possible solution for the extraordinary gyrations it makes; yet in time these become quite clear. As mentioned before, there are two elements in a boomerang, one is a bend which shows when it is laid on a flat surface, causing both the ends to be raised about $\frac{1}{4}$ inch from that surface, this causes the boomerang to come round in a circle, and the other is a certain propeller-blade twist which, acting against gravity, keeps it afloat. All boomerangs have to be thrown either in the perpendicular position or within a few degrees of it. Each boomerang has its own angle, which has to be found out. Then it has to be thrown to a certain height. This also has to be constant for that boomerang, and the knack of imparting the necessary spin has to be acquired. It is the correct combination of these three factors which results in a successful flight. They can be made to do one large circle and return to the thrower, and also made to do a variety of circles, coming down in a spiral or with pendulum movements. The figure of eight, with a circle in front and one behind, and then returning to the thrower, is very spectacular, and requires special knowledge at which angles to hold and throw the boomerang. It is astonishing the dis-

tance covered during the flight of a good boomerang. I have one which completes a circle with a radius of well over a hundred yards, and its rotations are so rapid towards its finish that it would fracture a skull or arm if it came in contact with either. With such a flight, it is not difficult to realise what extraordinary accuracy has to be employed to be able to hit an object practically a quarter of a mile away when height, angle and spin have to be considered, and the slightest variation in any of these will bring about failure. There are many left-handed native boomerangs. These, when thrown with the right hand, often go straight away, and do not return. With a little practice it is almost as easy to throw a left handed one with the right hand, holding the other end as to throw an ordinary one. The circle is then from left to right. There has been a good deal of speculation as to the use of the return boomerang. There is no doubt, from plenty of reliable sources, that they were used for procuring birds, and when thrown amongst a flock of duck, if they failed to strike one, would return to the thrower. Another use I have from an eye-witness is that of imitating a hawk. If there are ducks on a lagoon one black keeps throwing his boomerang whilst the other, with his head covered with reeds, slips into the water and pulls the ducks under by the legs. It is almost impossible to get a decent native boomerang which will return, much less do pretty evolutions. It is a great pity that so little interest has been shown in throwing the boomerang out here. It is a most fascinating pastime, and although I have been throwing for years, I never get tired of it. The difficulty of getting a piece of wood with a natural bend is easily overcome by having a stout piece of blackwood steamed to the desired angle and cut in strips. When complete, it should be varnished to prevent warping.

CITY FERNS.

From time to time one sees seedlings of Bracken growing on the bare walls of brick and stone buildings in Melbourne. These appear in early spring, but rarely survive the first summer. Those that do so, perish as they attain a larger growth owing to the lack of nourishment afforded to their cramped roots. For three years two small clumps of Bracken grew on the eastern side of the fountain in Spring-street, giving a little touch of Nature to the sombre basalt sculpture, until recently "cleaned off" by the gardener. For the last five years the Necklace Fern (*Asplenium flabellifolium*) has persisted beneath the basalt moulding of the Public Offices facing Treasury Gardens. It almost dies out during the hot months, but always appears fresh and green every winter.—A.E.R.

THE LATE MR. DUDLEY BEST.

Another link between the pioneers of the Field Naturalists' Club and the present members was broken on Sunday, 10th June, by the death, at the age of 85, of Mr. Dudley Best, one of the founders of the Club. Mr. Best is said to have first evinced an interest in natural history about the age of twelve years, when he commenced to collect insects, principally Coleoptera. He continued this pursuit for many years, gradually forming acquaintance with others with similar tastes. Towards the end of the seventies, these friends considered that there was room for a natural history society in Melbourne. Accordingly Mr. Best, with Mr. C. French, senr., and the late Mr. D. Kershaw, called a preliminary meeting for the 6th of May, 1880, at the Melbourne Athenæum, when about thirty gentlemen met, and, after giving the question due consideration, decided that such a society was desirable. A preliminary committee was appointed, of which Mr. Best was Hon. Secretary, to draw up rules, and report to a further meeting on the 12th May. At this meeting, it was decided to form a society to be known as the Field Naturalists' Club of Victoria. The office-bearers were elected, and included Mr. Best as Hon. Secretary. The first meeting of the Club was fixed for Monday, 14th June, and Mr. Best used to relate that when he interviewed the Town Hall authorities, and asked for the use of a room for the first meeting, he had great difficulty in convincing them that it was not a new sporting body. Mr. Best was re-elected the following year, and retained the Hon. Secretaryship for a period of four years, when he found that pressure of business claimed his whole time. He had, however, given the Club a good start, helped in many ways by his friend, Mr. C. French, who was equally interested in the success of the Club. He then, for another twelve years, acted as Committee-man, Hon. Treasurer, or Vice-President (1891-2, 2-3), refusing to accept the position of President when offered to him. In February, 1923, the Club decided to honour those members still remaining, who had been elected in May, 1880, by making them honorary life members, and he and seven others were so honoured. It is to be regretted that after a membership of forty-eight years, he was not permitted to share in the jubilee of the Club, due in May.

1930. That he never relinquished his interest in the Club is exhibited by the fact that he had attended two or three monthly meetings since the 1st of January last. During the first two years of the Club, he contributed a short series of papers, in which he recorded the life histories of a number of the longicorn beetles (his favorite family), found in the vicinity of Melbourne. These were published in the *Southern Science Record*, a magazine which preceded the publication of the *Victorian Naturalist*. In later years he contributed papers as follows:—"A Holiday Visit to North Mirboo" (*V.N.*, vi.,



p. 77); "A Visit to Logan, near St. Arnaud," (*V.N.*, xv., p. 35); and "To the Alps for Coleoptera" (*V.N.*, xxxvii., p. 85.) The first mentioned is written in a particularly happy style. Though his name does not appear, he on several occasions joined in trips with fellow-members, who undertook to place their results before the Club. He was not particularly fond of many companions on an excursion, preferring only one or two others with him, so that the ground selected could be thoroughly worked over. He took part in two of the early "camp-outs" of the Club, the Yarra Falls trip, in November, 1890, remembered by those who took part in it for the terribly wet weather experienced, and to the Grampians in Novem-

ber, 1891, when conditions were just the opposite. He had many favorite collecting spots near Melbourne, where he wandered alone, shaking the bushes into an umbrella for the sake of the beetles they might contain, and in so doing was more than once regarded as an escaped lunatic, but for one favorite spot on the Plenty, between South Morang and Greensborough, for years a paradise for beetles, he usually made up a small party, and visited it about Christmas time. Alas, the spread of sweet briar, and the introduction of dairying, have rendered that happy hunting ground utterly useless to collectors. His usual equipment for these outings was a good-sized whalebone umbrella, a small saw, and a strong knife, these latter being for the purpose of securing portions of branches expected to contain beetle larvae, in the detection of which, by outward signs, he was an adept. The pieces of branches were taken home, and placed in a breeding-cage to await the development, perhaps for many months, of the expected beetle, often a rare species. He thus added many specimens to his collection in perfect condition. It is gratifying to know that the many hundreds of specimens secured during his long collecting days, will, at his desire, find a resting place in the National Museum of Victoria, a monument to his patience and industry. It contains many unique specimens of several of which he was the first collector, three notable species being named after him, viz., *Morphnos Bestii* (Carabidae), from the Grampians; *Notonomus Bestii* (Carabidae), from Warburton; and *Macrones Bestii* (Longicornes), from the Alps. The collection is a model of neatness and arrangement, he being an excellent penman, and thus is an example for young collectors. Mr. Best, who was unmarried, arrived in Victoria with his parents in 1850. He was educated at the old Model School in Spring-street, and on leaving school at an early age, entered a merchant's office, remaining there all his life, ultimately becoming a partner. He retired from active participation in the business some twelve years ago, but though urged by his medical adviser to take more rest, he still persisted in visiting the city two or three times a week. During late years he lived at East Kew, where he took up the cultivation of Australian plants, and it was while attending to some of his favorites that he had the heart attack which so quickly proved fatal. For a great many years Mr. Best had been a member of the Masonic body, and its esteem of his good qualities was shown by the fine attend-

ance of fellow-members at the interment in the Melbourne General Cemetery, where also the President and a number of members of the Field Naturalists' Club assembled to pay their last respects to so faithful a member. It is understood that the Club, and several old friends have not been forgotten in the provisions of his will.—F.G.A.B.

NOTES ON *EUCALYPTUS MACULATA*, HOOK.

Specimens of *Eucalyptus maculata* Hook, were collected by me on April 24, in a locality north-east of Nowa Nowa, north-west of Orbost, and south, south-east of Buchan, and nearly 20 miles by road and track from Nowa Nowa. After a few miles along the Prince's Highway, the road leads northerly up the valley of Hospital Creek, through Wairewa settlement, about 11 miles from Nowa Nowa. From the settlement northerly, a rough bush road and, later, one of the many wood-carters' tracks, leads to the summit of the Mottle Range (which trends from the Mount Tara Range south-easterly).

Near the head of Hospital Creek, on one side, and the head of Bete Bolong Creek (a tributary of the Buchan River), on the other, but on the Buchan fall, the 10 acre patch of this Spotted Gum is most conspicuous, with its gleaming, white-spotted stems, in the midst of a forest of rough-barked trees, comprising, chiefly, *Eucalyptus eugenoides*, *E. Baucuriana*, and *E. polyanthemus*, with *N. Sieberiana* in the neighbourhood. The group has an open forest appearance, about six large trees (up to 3 ft. or so in diameter) to the acre, and smaller ones among these down to pole and sapling size. On the periphery of the patch there are numerous young saplings, and small seedlings, but old residents say that no one knows of any variation in the area. The principal undergrowth was a scanty, but continuous, waist-high growth of *Indigofera australis*, with, here and there, *Goodia*, *Hardenbergia*, etc. The ground round the trees was littered with the small, thin pieces of bark and the trunks of all the trees of more than pole-size exhibited the characteristic spotting of the species. I was accompanied by Mr. M. H. McMahon, District Forester, without whose assistance I could not have found the locality.

There are National Herbarium specimens of *Eucalyptus maculata*, from two localities in Victoria, viz., Mottle Range, Bete Bolong, and one in the Cann River Valley. From the former locality, Mr. (now Sir Albert) Kitson, sent a meagre specimen in 1900; from the latter, fruit specimens were collected by Mr. H. B. Williamson, near Mr. Fred. Broome's home, on the Cann River, January, 1920. Mr. Williamson's exhibit of a specimen from the Cann River locality, collected in May last from Cann River by Master Erle Broome, has its own special interest, as there appear to be just two old trees, about 150 feet high, and one young example, about 12 feet; and no other specimens known to the residents about the Cann River. The Bete Bolong specimens have been accepted as of the species named, by the Government Botanist, and deposited in the National Herbarium, whence they have been borrowed for exhibition. Dr. Green's specimens of *Eucalyptus Smithii* were collected on the other side of the Tara Range, about six miles to the west.—A. D. HARRY.

THE POWERFUL OWL.

BY DAVID FLEAY.

Few of us have had the pleasure of a close acquaintance with the lordly Powerful or Eagle Owl (*Ninox strenua*). This magnificent bird is at home throughout the deeper bush of Queensland, New South Wales, and Victoria, and invariably haunts the deep secluded gullies.

The Powerful Owl is the largest of Australian Strigiformes, and a member of the Bubonidae or Hawk Owls, so that the familiar little Boobook is a cousin.

At the beginning of the year a fine Owlet of this kind was added to my collection, and it has been wonderfully interesting to watch his various habits, and note the gradual growth and change in plumage. "Ferox," as my mother aptly named the fierce-looking young owl, measured four feet three inches across the extended wings, as a downy youngster, not long able to fly, and from beak to the tip of the tail feathers, adult birds are known to be two feet in length.

An idea of the Powerful Owl's large size and stout appearance is conveyed by the fact that on several occasions, in the company of different friends, I have come upon the birds perched for the day in the bush, and on two of those occasions, heard the same remark—"By jove, he's like a turkey."

Naturally, the large brown wings, barred with lines of white, help in bringing about this comparison.

Frequently, when sleeping out in the deep forest in frosty weather, we have heard the big owls calling in the double-note which reminds one of a deep and deliberate "more-pork!"

It sounds to me like "woo-hoo!" slowly uttered, and often with an emphasis on the second syllable.

The interesting part is that on mimicking this far-sounding note in two localities 60 miles apart, Powerful Owls have thrilled us by appearing silently in overhead trees, and answering at close range.

At the present time "Ferox" lives in an enclosure outside my window, and is just finding his voice, which has changed from a shrill note to a deeper tone.

Almost every night he endeavours to utter the "woo-hoo" cry, but his ambition is a little ahead of his capabilities, and when he tries to add volume to the sound, the result is an amusing double-croak.



However, he is a most persevering bird, and is certainly improving in these nocturnal rehearsals. I am looking forward with some excitement to hearing a good exhibition from him, of the startling screams by which Powerful Owls have struck terror into the hearts of more than one unfortunate person in the bush at night.

No one would suspect that he could be capable of such weird noises to see him winding his head round and round in a most comical way at the shadows cast by a lantern, for, like most young owls, "Ferox" is playful. The terrifying cries are easily the most unearthly sounds to be heard in forest country at night, and many bushmen describe them "as being what they would expect from a number of women being brutally strangled."

I have heard this unpleasant description of "the great Scrub Owls'" call from different localities, especially near Beaufort (Vic.), and should "Ferox" come up to expectations, he will certainly wake the night echoes. I have heard the cries in the bush, but it will be most interesting to hear them at a close distance.

A fortnight ago a eucalyptus distiller told me that what disturbed him most was the awful moaning sound heard at the end of the cries.

The Owls seem to repeat the same series of screeches several times over, and very often they call when out in an open gully away from the dense home bush. "Ferox" seems to realize that he is a descendant of a noble line, and woe betide the person who approaches too close, for the bird will readily attack, using his great talons and beak as formidable weapons.

The "woo-hoo" call is heard very regularly in the bush at dusk, and in the early dawn, while in suitable calm weather you may hear the birds at irregular intervals through the night.

Ring-tailed 'possums, greater flying phalangers, rabbits, birds, and lesser bush creatures, are favourite game of the big birds, and during the last vacation (May), near Daylesford (Vic.), I examined the disgorged bones and fur of a ring-tailed 'possum beneath a fine old blackwood tree, in which a splendid Powerful Owl has perched for many years.

This year I have only seen him twice, but heard his "woo-hoos" countless times. He does not perch consistently in this position, and the bent tail feathers seem to indicate that he spends odd days in some big hollow gum.

"Ferox" shows one of the traits of his kind in occasionally perching throughout the day with the remains of a rat or birds clutched in his long curved talons. His prominent beak and small head give him a very eagle-like appearance, while the yellow irised eyes defy description when the Owl is angered.

In the deep forest country the "woo-hoo" calls contain much of the mystery of the wide bush in its darker hours, and the big owls seem to sense some of the wonder of the stars above, and dim earth under," when they remain still and call through the silent trees.

NOTES FROM MY DIARY.

APRIL—MAY—JUNE.

April 4th.—A pair of Hooded Robins seen. They come from the bush-land to the open country in the autumn.

April 9th.—*Pterostylis obtusa* in bloom.

April 14th.—Flame Robins have returned from their summer haunts; they appear to be more numerous than usual. I counted eight males in one flock.

April 24th.—*Leptospermum laevigatum* in flower here and there—quite out of season.

April 27th.—Hundreds of Bogong moths about. I saw one feasting for nearly half an hour on stewed apple.

May 1st.—Some *Thryptomena Miqueliana* measured over 7 feet in height. Observed a flock of 30 White-faced Herons.

May 10th.—A plant of *Stylidium graminifolium* in full bloom. The one stalk was bearing 30 unripe seed capsules, 20 open flowers, and about 20 buds; some of the latter still quite immature.

May 14th.—*Acacia suaveolens* in full bloom.

May 17th.—Last Dusky Woodswallows noticed for the season. It is the latest departure of this bird I have known.

May 18th.—Saw an Australian Goshawk strike at and kill a Red Wattle-bird.

May 22nd.—A pair of Fan-tailed Cuckoos seen, and I heard their two distinct calls—the trill, and the double mournful notes, which are repeated in a lower tone.

May 31st.—Collected a specimen of *Samolus repens*, which was 59½ inches in length. It had clambered up several feet through loose bark of *Melaleuca ericifolia*, and then drooped to the ground.

June 6th.—A White-breasted Sea-Eagle passed overhead.

June 13th.—Killed a snake 14 inches in length, apparently the White-lipped species (Vic. Naturalist, Vol. XLIII, No. 12, page 338). Evidently the warm sunshine had tempted it out.

June 14th.—*Pterostylis concinna* in early bloom.

June 16th.—A very fine White Egret seen. It is one of the rarest of our local water-birds.

June 17th.—*Cyrtostylis reniformis* flowering.

June 18th.—A "silent" Fantailed Cuckoo observed.

June 25th.—*Albizia lophantha* (native of W. Australia) in full bloom. An early record for this tree.

June 26th.—Found some *Coryphanthes fimbriata* in flower.—FRED BARTON, Jnr., Sperm Whale Head, Gippsland Lakes, 1/7/28.

PTEROSTYLIS GRANDIFLORA, R.Br.

BY (MRS.) EDITH COLEMAN.

Not for many years has this loveliest of our Greenhousds flowered in such profusion as at the present time.

It is, I think, the most beautiful member of a genus which includes species unsurpassed for their exquisite lines and graceful curves, while it more than holds its own with any single-flowered terrestrial orchids of other countries, with which I am familiar.

The keynote of *Pterostylis grandiflora* is simplicity.

A slender, solitary-flowered species (occasional two-flowered specimens have been noted), individual beauty is never lost in overlapping lines, or indefinite curves, so often the case where a number of flowers are crowded on one stem.

Instead, the eye may follow every curve, each of which is nothing less than perfection.

The body of the flower is of a translucent white, with dark green striae. The expanded parts of the paired petals, which, with the dorsal sepal form a hood for the protection of the essential organs, are reddish-brown in colour.

The lateral sepals are extended into thread-like points rising above the hood in exquisitely graceful lines.

The delicate veinings on the lower lip are especially beautiful—suggesting the neurulation of a moth's wings.

The labellum is constricted at about two-thirds of its length into a long tapering point, slightly thickened, or clavate, at the tip.

At one stage it is very irritable—as sensitive to touch or movement as that of *P. longifolia*, and several other members of the genus.

At first glance one wonders just what purpose is served by this extraordinary organ, since it is not attractive, and being hidden from the front by the downward sweep of the hood, does not present a visible landing stage for insects. In many instances the visiting insect comes in contact with the *side* of the labellum, and this at a touch rises against the column without imprisoning its visitor. One notes, however, some well filled capsules, so doubtless pollination is accomplished by insect agency sufficiently frequent to secure the benefit of an occasional cross; but the isolation of the species points to more general reproduction by the vegetative method.



1 natural size. These 3 flowers resembled, in size and depth of colour, specimens from Queensland.



1 natural size. The flower on the left shows the labellum hidden by the downward sweep of the calyx.



Pterostylis grandiflora, R.Br., slightly less than natural size.

There is usually no rosette at the time of flowering, and the large lanceolate leaves are developed alternately up the stem.

With the exception of size, which is dependent to a large extent on seasonal and habitat conditions, there appears to be little variation within the species—either in structure or colour; but recently Mr. A. B. Braine, a Victorian orchidologist, with many original observations to his credit, noted an all-green flower.

The haunts of the Long-tongued Greenhood are among the tangled vegetation that clothes the banks of little creeks, in dank mountain gullies, or on cool, well-clad hill slopes; and the setting is a fitting one, for the plants are so well hidden, often so cunningly camouflaged, that one rarely discovers more than a single flower at a time, rising out of its tangled cover in a queenly isolation that calls for individual admiration.

But the present is an exceptional season, and recently we came upon a patch of five flowers growing closely together, with as many more within a foot or two. They made such a beautiful picture that we persuaded a skilful artist to take a photograph of them *in situ*.

Many of this season's flowers equal in size and depth of colouring specimens from Tambourine, Mt. Queensland, a station they favour.

P. grandiflora has long been regarded as rare, but with a better knowledge of its habitat preferences, it may be found to be less local than is supposed.

I had long despaired of finding its haunts, suspecting it to be, within 20 miles of Melbourne at least, a botanical "Mrs. Harris," but with a knowledge of the situations it prefers (for which I am indebted to Mr. H. Dickens) it was not long before we found it in a number of other parts.

This season other orchid lovers may have the same experience.

Last evening, about sunset, a large flock, apparently about one hundred, Mudlarks, *Pied Grallinas*, were assembled in the Botanical Gardens, settling on the north side of the lake to roost for the night. Illustrating the trustfulness of the birds there, my brother and I were walking through one morning recently, when we came upon a very small Spine-billed Honeyeater bathing in a tiny pool of water in a drainpipe. We stopped alongside, my foot not being 9 inches away. The little fellow repeatedly and alternately dipped and splashed, and flew into a small bush close by, taking not the smallest notice of us.—W. H. INGRAM, 9/7/28.

ORCHIDS IN WINTER.

Many terrestrial orchids have come to hand this winter, the most interesting and important being *Pterostylis Toveyana*, Ewart and Sharman, from Greensborough district, an additional ground for this neat little Greenhood. The only other localities in Victoria for this species are Mentone and Aspendale. Unfortunately, owing to clearing and building operations, it does not now occur at Mentone.

The collectors, Mrs. E. Coleman and Mr. A. B. Braine, report it as fairly abundant, and in association with *Pt. alata*, Reichb., and *Pt. concinna*, Br.

The specimens received show a pleasing uniformity—in the stem-leaves and in the labellum; characters unstable in those specimens collected elsewhere. Proof that the new collecting ground has known this unique species for a considerable period.

Corysanthes unguiculata, Br., has been found in considerable numbers at Airey's Inlet by Mrs. Sutherland, of Mogg's Creek. From this fine collector, I have received unusually fine specimens of both *Acianthus exsertus*, Br., and *Acianthus reniformis*, Schlecht. Some specimens of both species were of a height of 9 inches, with numerous flowers. From a lonely outpost in Tasmania, comes a number of *Corysanthes bicalcarata*, Br., collected by the Ven. Archdeacon Atkinson, of Penguin. The largest specimen 1 inch in height; the smallest $\frac{3}{4}$ inch; in colour, *light red*, with the usually prominent spurs hardly discernable. Quite a contrast in size and colour to those collected at Paterson (N.S.W.) by Rev. H. M. R. Rupp. Some individuals (and there were many) were over 2 inches in height, and very dark purple in hue.

Warburton (Vic.) gives us an unique form of *Corysanthes dilatata*, Rupp and Nicholls. I have so far secured but two specimens. These show a very broad squat hood, over a delicately tinted, yet conspicuously veined labellum, with a broad boss; below appear conspicuous auricles. The colour is dull purple. Collected near Mt. Donna Buang by Mr. Schlippe, of the Melbourne Walking Club.

Our most beautiful Greenhood, *Pterostylis grandiflora*, Br., has been conspicuous by its presence in a new spot—west of Lockwood—in quite open forest. We found

them numerous. One specimen (an "albino") was a very pale green shade. The only one, to my knowledge, ever collected.—W. H. NICHOLLS.

HAUNT OF THE BELL BIRDS.

Not long ago, I located a colony of Bell Miners, *Manorina melanophrys*, in a group of white gums which stretched for some distance along Hoddle's Creek. Several dozens of the birds could be seen flying about, having a peculiar planing motion in going from tree to tree.

I stood motionless. Soon a single bird flew into a sapling about a yard distant. I saw that it was working over both surfaces of the leaves, with its beak. As the white gums were all infested with a curious white conical scale, it was to be plainly seen that this was what the bird was eating.

The deftness with which it detached the scale from the leaf—first knocking off the tiny white cap, which could be seen floating to the ground, and then eating the underlying insects—was marvellous.

Under minute inspection these insects proved to be black (or brown) and orange red in color, and about one-sixteenth of an inch in length, each one being supplied with the white cone-shaped covering.

The Bell birds as a whole were very trusting, flying contentedly around me, after a while. Their favourite nesting place appears to be the tea-tree thicket, which grows in a swamp just across the road from their feeding ground.

Of late, the number of Bell birds has been decreasing owing to their wholesale slaughter by pseudo sportsmen, usually visitors from the city.

The call of the Cuckoo Shrike:—Noticing in the "Bird Book" that the call of the Black-faced Cuckoo Shrike, *Coracina robusta*, was a "purring note," brought to my mind an incident which occurred recently in a large gum tree in my wild-flower garden.

Attracted by the unusually harsh shrieking cries somewhat resembling the cry of a baby (quite the reverse of "purring note," in fact), I looked up and saw three Cuckoo Shrikes pursuing another, which with something to eat, was coming to rest in my tree. Then much dodging amongst the branches commenced, the owner of the morsel having a difficult time.

Suddenly, this bird dropped its food, which, as it floated downwards, I could see was a rather large moth, nearly three inches in length of body, and of a cinnamon-fawn color.

When about ten feet from the ground, the original owner quickly retrieved its moth, and flew off, followed by the others, which were still uttering the shrieking calls.—EVELYN LYLE, Yarra Junction, Vic.

CORRECTION.

My *Naturalist* is, at 4 p.m., just to hand. In case it might be cited in future as a find from Wattle Glen in June, it would be as well that the *Stylidium* recorded by our friend Miller should read *S. graminifolium* (not the minute *S. despectum*, which it is not at all like). You will remember the flowering plants found were tall, 12 to 15 inches high. *Despectum* is only an inch or so high.—A.J.T.

THE FROGGATT ENTOMOLOGICAL COLLECTION.

BY F. ERASMUS WILSON, F.E.S.

This collection, the life work of Walter W. Froggatt, F.L.S., author of "Australian Insects," "Forest Insects," and numerous taxonomic and economic papers in various scientific journals, is at present temporarily housed in Melbourne. By courtesy of the Council for Scientific and Industrial Research, the writer was recently afforded an opportunity of examining it. The collection is contained in some forty to fifty store boxes, besides numerous microscopic slides and tubes of spirit specimens. Scattered through the various orders is a fair number of types of Froggatt's, and other well-known authors, and if only from this point, it is of considerable scientific importance.

During the long time that Mr. Froggatt was acting as Government Entomologist, and later Forest Entomologist for New South Wales, he had numerous opportunities of getting together collections of insects of prime economic importance, and herein lies the principal value of this well-known collection. Fruit flies are, of course, a very serious pest, particularly to growers in northern New South Wales and Queensland, and I noticed a fine series of them when looking over the material. Included amongst them were Froggatt types of six species of the large genus *Dacus*, and also the type of *Ceratitis loranthe*, Frogg. There is a particularly fine case of *Psyllidae*, or Lerp insects—a group upon which Mr. Froggatt did a considerable amount of work, and described many species. In most instances, the various stages in the development of these insects are exhibited.

The *Phasmidae* are represented by several fine species, amongst which might be mentioned *Tropidoderus rhodomus*, McCoy, and the remarkably formed *Exaltosoma tiaratum*, MacL., which is figured in "Australian Insects." One small box is filled with examples of the rare little *Mantispas*, Neuropterous insects which bear a striking resemblance to many of the true *Mantids*. Another little case of interest, is that containing *Hemerobiides*, of the genus *Psychopsis*. Here is found a fine series of that handsome insect *Psychopsis illidgi*, Frogg. Some species of that remarkable orthopterous family, the *Embiidae*, or web spinners, next attracted

my attention, and I noticed the types of two of Mr. Froggatt's species, *Oligotoma gurneyi*, and *O. agilis*.

Amongst the grasshoppers and locusts one sees many insects of singular beauty and large dimensions, some of the finest of them coming from the Solomon Islands, New Guinea, etc. *Gyrillidae*, or crickets, are also fairly well represented, particularly those forms with enormously elongated antennae, commonly known as tree crickets.

Apart from the wonderful gall making thrips, the order *Thysanoptera* is rather poorly represented. The collection of gall makers, however, is very fine, and contains types of some of Mr. Froggatt's species. There are numerous species of the larger *Hymenoptera*, and some of the finest insects in the whole collection are ranged under this heading, particularly some from the Island of Ceram. Native bees are richly represented, a fair number being named, and amongst them I noticed several of Dr. Cockerell's types, e.g., *Halictus froggatti* and *H. exterus*, two species which I cannot find listed in Mr. Hacker's valuable catalogue of Australian bees. Most of the *Thynnidae* have been determined by Rowland Turner, and several of his types and cotypes may be observed. One small box is filled entirely with those highly metallic, green and blue wasps of the family *Chrysididae*, which are parasitic upon wasps of other families, and which are so active upon the wing, that their capture is always a matter of some difficulty. Although all families of wasps are exhibited, possibly the most attractive are the *Sphegidae* and *Scoliidae*, *Scolia fulva*, Grey, and *S. zonata*, Sm., are two species that at once attract the eye.

Some groups of *Diptera* are very nice, two in particular, the *Tabanidae* and *Asilidae*, containing some showy insects. Amongst the *Tabanidae* one might mention such forms as *Tabanus walteri*, Taylor; *T. avidus*, Bigot; and the huge *Scaptia guttata*, Don., a broad black fly, with white spottings. One little known family of flies, the *Hippoboscidae*, it is worthy to note, is particularly well represented in this collection.

The *Hemiptera* (*Heteroptera*) are contained in several cases, and besides Australian species, there are many from Ceram and the Pacific Islands. Only a portion of even the largest of these is named, and no doubt

many undescribed species are scattered through the cases. The predaceous *Reduviidae* are a feature of this part of the collection. Amongst the *Hemiptera* (*Homoptera*), of course, the Cicadas are pre-eminent, as Mr. Froggatt no doubt had a soft spot in his heart for them. Several types of species described by Dr. Goding and himself are here, also cotypes of some of the species described by Distant from Central Australia and the Pacific Islands.

That curious family of Hemipterous insects, the *Aleurodidae*, or snow flies, have a small case to themselves. Mr. Froggatt will no doubt always be better remembered by reason of his labours amongst the *Coccidae*, or scale insects, than in any other group, and, needless to say, the collection is extremely rich in examples of this family.

In the order *Coleoptera* one finds a fairly representative collection, although the large family, *Curculionidae*, is less numerous in species than one would expect in such a gathering of insects. Amongst the Longicorns I noticed two rather nice things in *Typhosecis macleayi*, Pasc., and *Acanista alphoides*, Pasc. Under the heading *Lucanidae* were four examples of the quaint *Ceratognathus froggatti*, Blackb., and a particularly rare Anthicid that aroused my cupidity was *Lemodes splendens*, Lea., two examples of which were present. The family *Carabidae* exhibits some rare species of the genus *Carenidium*, always much sought after by coleopterists, and a fine pair of *Mecynognathus dameli*, MacL., caught my eye. Beetles of the families *Scolytidae* and *Bostrychidae* are fairly numerous, many species having been bred from various timbers imported from foreign countries.

A somewhat comprehensive collection of Termites is met with amongst the spirit specimens. These are both Australian and foreign, and contain cotypes of Harvilland's Malayan, Wasmann's Madagascan, and Holmgren's and Silvestri's South American species, besides types of some of Froggatt's own, including the type of the remarkable *Mastotermes darwiniensis*.

One could well comment on other features of the collection, but lack of space precludes doing so. The collection, I understand, will, in the near future, be housed at the Bureau of Entomology at Canberra.

UNDERGROUND BOTANY.

It has often occurred to me that, when all the flora which is to be found on the crust of this earth, has been entirely classified and every known corner of this planet has been thoroughly searched, we shall be forced to seek underground for new species, etc. I daresay many people have noticed that when portions of our earth's surface is removed by agencies either human or otherwise, foreign weeds, shrubs, or ferns often spring up in localities where they were never known before. I remember once walking through some country on the foothills of the Grampians, gathering flower specimens as I went. At one place I came across an old mining shaft, which I have since ascertained was sunk about 30 years ago. As I was passing, I noticed growing on the mullock heap which had been thrown from the shaft, an orchid which seemed unfamiliar. It was a dark blue *Thelymitra*, much like *ixioides* at first glance, but had no spots whatever. The backs of the petals were blue at the edges, but had a yellow stripe down the middle, and it had a spiral leaf. I, of course, sent it to Dr. Rogers, who became very interested, and explained that it was quite a new species of *Thelymitra*, having many differences from any other known species in structure, and also the spiral leaf was peculiar. However, he could not proclaim it a new species until some further specimens were sent along, so it was held in abeyance for the time being. Every season, at the same time, for many years I have visited that same spot, but never another specimen could I find. Then it dawned on me one day that the seed or bulb of that orchid had probably been unearthed by the miner who dug that shaft, and being thrown up to the surface through the agency of light and moisture, had germinated, and the species may have been extinct for perhaps a thousand years. I have often noticed, and no doubt others have, too, that where excavations occur, strange plants or ferns often grow up in the most unexpected places. There is, in the Victoria Valley, on the western side of the Sierra Range, large areas of swampy country, where there grows for miles the Emu-grass, or *Restio tetraphyllus*, as it is botanically known. On the eastern side of the Sierra Range no *Restio* is to be found, and yet at the Stony Creek diggings, where about 20 feet in depth of soil had been sluiced away, up came several fine bushes of *Restio*. The Victoria Valley being large, had not been filled up with the debris, etc., from the mountain sides, as was the case in Hall's Gap or Stony Creek, and the same flora evidently existed there in former times. How many places in Victoria are there, and I think a great many, where bulrushes have made their appearance in excavations, etc., where no bulrushes grew before. I have seen in mining shafts in the driest places imaginable, where the miners have sunk through an old stratum, ferns grow up in abundance. It may so happen that in time to come the Naturalist will sally forth, not with a vasculum or tin, in which to put his orchids, but with a pick and shovel, when he will have to search for different strata, which were laid down countless years ago; and, which, when brought to the light and moisture of the earth's surface, may yield many treasures to those of the days to come. The discovery of that new orchid in West Australia, which I am told blooms underground, also helps to support my theory that in time to come botany, at any rate, will be partly concerned with the possibilities of underground research.—C. W. D'ALTON, Hall's Gap.

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THE FIELD NATURALISTS' CLUB OF VICTORIA.

The ordinary monthly meeting of the Club was held in the Royal Society's Hall, Victoria-street, Melbourne, on Monday, August 13th, 1928. The President, Mr. F. E. Wilson, F.E.S., occupied the chair, and there were about 100 members and visitors present.

CORRESPONDENCE.

From Miss R. S. Chisholm, thanking members for expressions of sympathy in regard to the recent death of her father.

From Mr. William Lawford (Benalla), thanking the Club for his election as a Life Member.

From the Chief Secretary, stating that it was not considered advisable at the present time, to increase the representation on the State Advisory Council for Fauna and Flora.

From Mr. F. J. Rae, requesting the Club to appoint two delegates to attend a meeting in the Melbourne Town Hall on August 23rd, to discuss the proposed formation of an Institute of Horticulture.

From Victorian Tourist Bureau, giving particulars of the "Nature Study Camps," to be held at the Grampians during September.

From Miss Florence Woodfield, drawing attention to the destruction of trees and palms in the Fitzroy Gardens, and suggesting that the Club take action in the matter.

After some discussion, it was moved by Mr. M. J. Woodhouse that the matter of the trees in the Fitzroy Gardens be left in the hands of the Committee. Seconded by Mr. E. E. Pescott, and carried.

The President announced that Messrs. G. Goghill and E. E. Pescott would represent the Club at the meeting on August 23rd, in regard to the proposed Institute of Horticulture.

REPORTS.

Reports of excursions were given as follow:—East Ringwood, Mr. F. G. A. Barnard; Mt. Morton (Belgrave), Mr. F. Pitcher.

ELECTION OF MEMBERS.

The following were duly elected on a show of hands:—As Ordinary Members.—Dr. J. A. Leach, Education Department, Melbourne; Miss K. A. Ball, 42 Scott Grove, East Malvern; Mr. C. G. Hodgson, Dresden-street, Heidelberg; and as Country Member.—Mr. Edgar Ellis, Mount Ara, Greta.

GENERAL.

The President welcomed Mr. G. Weindorfer, of Tasmania, and Mr. W. Scott, of Emerald, to the meeting.

The President announced that the late Mr. Dudley Best had bequeathed to the Club the sum of £50, which the Committee had decided to place to a special fund to be known as the "Best Fund," the income therefrom to be used for the purchase of books for the library. Messrs. F. G. A. Barnard and F. Pitcher spoke in terms of approval of the action of the Committee.

Mr. A. D. Hardy announced that the Committee of Management had, at its last meeting, changed the name of the reserve near Paynesville from Sperm Whale Head National Park to the Lakes National Park.

LECTURE.

A very interesting lecture was given by Mr. Tarlton Rayment on the subject of "Native Bees." Mr. Rayment traced the life histories of some of the Cliff-Bees to be found at Sandringham, and touched on many of his experiences encountered while studying the habits of these insects.

EXHIBITS.

By Miss C. C. Currie (per L. L. Hodgson).—Sprays of Peppermint Gum (*Eucalyptus piperita*) covered with white scale, the main food of the Bell-miner (*Manorhina melanophrys*), in the Lardner district of Gippsland.

By Miss J. Raff, M.Sc., F.E.S.—(a) Living land planarian (*Geoplana spenceri*, Dendy); (b) "Cocoons" of Giant Gippsland Earthworm. Both collected for the Zoology Department of the Melbourne University by Mr. Wm. Johnston, Korumburra.

By Mr. J. Searle.—(a) Specimen of Millipede (over 3 inches long and $\frac{3}{8}$ inch diameter) from New Ireland (Bismarck Archipelago), also mites, numbers of which were found attached to the Millipede; (b) micro. slides showing structure of Bee, and Professor E. Zander's fine illustrations of the micro-structure of the Bee.

By Miss M. L. Wigan.—Specimen of Nodding Greenhood (*Pterostylis nutans*), from Eltham.

By Mr. G. Coghill.—Specimens of cultivated flowers.—*Grevillea rosmarinifolia*, *Tecoma Australis*, *Acacia podalyriæfolia*, *A. myrtifolia*, *Eriostemon myoporoides*, and *Thryptomene calycina*, and fruits of *Eugenia Smithii*.

By Mr. W. H. Nicholls.—Water-colours of six species of Victorian orchids.

By Mr. H. B. Williamson, F.L.S.—Dried specimens illustrating Part IV. of "The Lilies of Victoria."

EXCURSION TO MOUNT MORTON, BELGRAVE.

We were favored with beautiful weather for this excursion. The party consisted of 11 members and friends, including Mr. G. Weindarfer, of Cradle Mountain, Tasmania. Mount Morton is situated about two and a half miles south from Belgrave. We took the pathway leading from the station to the local recreation reserve, for it provides a short cut to a well-formed and easily graded road, along which we journeyed to the bridge over the Monbulk Creek.

Although very few plants were in bloom, the two *Pimeleas*, *P. flava*, and *P. axillaris*, *Acacia myrtifolia*, and *Spyridium parvifolium*, were conspicuous with their blooms. *Pterostylis nutans* and *P. longifolia* were also collected in flower. The vegetation of this district is always interesting by its variety. Near the bridge some fine examples of *Eucalyptus regnans* still survive, together with a number of young saplings arising to take their place ultimately. Some fine groves of tall Silver Wattles, *Acacia dealbata*, were here, too, beginning to make beautiful displays of their early golden bloom.

On leaving the creek, and following a track up the hill on the south side, we made a short cut to the road leading to Lockwood. Turning then towards Lockwood House, we walked along the road on the east side of the recreation reserve there, and came into touch with numerous heath plants in full bloom. Another half-mile brought us to a second valley and creek crossings, from where we gradually ascended for about a mile to our destination, passing through some very pretty natural heath gardens. Mount Morton is an almost bare, cone-shaped hill, rising several hundreds of feet above the surrounding country, and provides a very fine panoramic viewpoint.

On the return journey over the mount, and down the hill through the heath ground, we collected specimens of the numerous shades of bloom, from white to pink, and pink to red and deep red, which abounded there, and also seedling native plants, with which to beautify suburban gardens. We took the old road to the station, and en route inspected the Monbulk Reservoir and its surroundings. Although on previous occasions the musical Bell Miners have been heard here in numbers, only a few of their notes were resounded from a distance.—F. PITCHER.

THE GREEN TREE-ANTS OF TROPICAL
AUSTRALIA.

By F. P. Dodd.

None of the thousands of kinds of ants known is more remarkable in habits than the pale-green arboreal species (*Oecophylla virescens*) of tropical Queensland and Northern Australia. The curious, and often bulky, nests of these ants are familiar objects, but of the insects themselves and their ingenious methods of constructing such nests, most people, probably, are ignorant. I shall endeavour to describe the growth of an ant colony from the beginning.

A young queen, after her brief nuptial flight, returns to the trees, and, seeking out a satisfactorily curled leaf, likely to afford security from enemies and bad weather, takes possession, and, almost immediately, as is the way with queen-ants when about to enter upon the serious duties of family-raising, deliberately divests herself of wings, thus voluntarily becoming a lifelong prisoner. No more rapturous excursions into the blue for her; henceforth, avoiding the light, she remains in the gloom of the nest for years, perhaps ten to twelve; and produces eggs, by the thousand, until she dies. A writer terms certain queen bees the Methuselahs of the insect world, but that distinction belongs to the queens of ants, recorded lifespans of several being from twelve to fifteen years, and greatly exceeding that of any bee.

Our Green Tree-ant queen is not a small creature, being three-fourths of an inch in length, and of most robust build, her subjects being slender in comparison, and but one-third of an inch in length. After parting with her wings, the queen deposits her first eggs, merely a few, perhaps about twenty, for the resultant larvae must be fed; and as their sole and faithful guardian, she must never leave them. What a change from the bustling nest, so recently vacated, where she was surrounded by other young queens, mild-looking males, and the innumerable workers of the community. How different from queen-bees, which are never without company. Now our queen is in solitude; and does not possess wings, which queen-bees always retain.

In cold climes, the ova of ants hatches in about three weeks, but in the tropical North a much shorter period suffices. Assuming that the larvae have appeared, whence comes their food supply? *From the queen-mother only*, being liquid nourishment, stored in her body

for the purpose, regurgitated and administered to the tiny, helpless things, as required. Upon this they thrive and attain full growth, being then ready to change into the pupal state. But, before entering upon this change, they are required to take part in a most amazing operation, to be described further on.

The larvae of many species of ants possess silk-secreting glands, the substance produced being for the purpose of constructing cocoons, in which the important pupal metamorphosis occurs; and though our tree-ant larvae are provided with an ample supply of this silken material, no cocoon has ever been seen in a nest of the species, and, most likely, never will be. However, the silk is present, and, although not to be made use of in the ordinary manner, it is not to be wasted, for that is not Nature's way. The young queen-mothers are aware of this supply, and, at the proper time (for, if permitted, the larvae might attempt cocoon-spinning), they proceed to utilise it as, doubtless, many thousands of generations of queens have done before.

The frail leaf-home is too exposed, too open to the weather; wet and windy days are approaching, therefore that opening should be closed, not only against inclement weather, but also against likely meddlesome creatures. But how is that work to be carried out, and where are the workers? The one reply covers both enquiries, viz.: By the queen, assisted by the larvae—a combination unique, except in a few other species of ants, throughout the zoological world. So one by one she takes the soft, helpless grubs in her strong mandibles, with the head pointing outward, and passes each deliberately, and tenderly, up and down between the margins of the leaf, until a filmy fabric appears across the open space; it consists entirely of web supplied by the larvae, for, as each one's mouth comes into contact with the leaf, it complaisantly (we may not be justified in saying, dutifully!) allows the sericeous matter, in the finest of threads, to run out, and on it runs, from each larva in succession, until exhausted. This new, though certainly flimsy, defence is strengthened so far as the available silken supply admits. Back in the nursery, the larvae are placed, there, at last and still under the care of the ever-watchful young queen, to become pupae, and, finally, worker-ants.

Temporarily, the recently-emerged ants are weak; but when fit, and Nature ordains, out they troop in quest of food, for themselves and their long-fasting mother. With-

out guides or assistants, and in a world, to them, vast and strange, they search for and obtain that food!

The queen, her days of nursing over, fed and reinvigorated, and with the small company of loyal and willing workers around her, proceeds with ova-depositing; henceforth nothing else concerning her. In time, further family members appear, having been reared by some of the ants of the original little brood, which were placed in, or assumed, charge of nursery matters; therefore larger homes become imperative for the increasing population, and ere long there is a more commodious one, into which queen and all remove. Then, besides additional domiciles in the near future, homes or shelters have to be prepared for friends and associates, which early appear, such as caterpillars of several lovely butterflies and moths, various froghoppers, scale, and other insects. Throughout the ant dominions, each species has certain valued friends; each its particular fancy in larvae of moths and butterflies; small beetles of curious forms, and many other creatures, but chiefly insects, some of which seldom, and others perhaps never, see the light. The histories of some of these queerly assorted insects are most fascinating, indeed, are veritable fairy stories.

It is certain that, without ants as attendants and protectors, many species of insects would suffer extinction; a few being so completely dependent, that, abandoned for two or three days only, they would assuredly perish.

I have alluded to the multiplication of nests for the growing colony, and the advent of various insect friends. Having explained how the first small nest was prepared by the young queen, I now have other nests to deal with, some larger than a man's head, and in their formation containing from a few to scores of leaves, according to their kind and size, and the housing accommodation required. All the leaves are securely joined together and the nest made perfectly waterproof. The queen has nothing to do with these later constructions, her sole business now being to deposit eggs, some of which will produce males; others, queens; and the vast majority worker-ants of two castes, the smaller to attend mainly to household duties, the larger, to those of nest-building, foraging, fighting, home defence, and care of flocks and herds.

A dozen nests may be formed upon a tree, few shrubs or trees being too small for refuges or nests, and few trees too tall for the latter. Examination of the nests will show that they are fairly spherical, the leaves lying

Plate V.



A Nest of the Green Tree-ant.

[Photo, C. Barrett.]

side by side, and secured at their margins and ends. Inside there are other leaves, arranged and fastened as size and position admit, to form and serve as hatching, feeding, and dwelling chambers. Conceive the vast amount of energy required to bring the obstinate leaves into position; and the multitude of larvae, brought from heavily-stocked nests, maybe considerable distances away, used as "silk-shuttles," in cementing the leaves together; for, as in the case of the early little nests, the larvae provide the fastening material, the same delicate silken filaments as before, but, necessarily, in much greater quantities, to ensure keeping the leaves in place permanently and rendering the home secure.

When intent upon building, bands of workers assemble towards the end of a branch, the leaves of which, doubtless after careful inspection, being deemed satisfactory, are to form the new abode. One observes no leaders, no fussiness; and though building experience may be lacking in the younger ants, all, sedately and in manner certain, as well as with thorough understanding, set about their different duties, there being no petty troubles as to position or class of work, and, be it noted, no disinclination to exertion, and no indication of strikes even!! May we not learn much from the ant?

The branch to be operated upon may bear from a dozen up to several scores of leaves, some, or all, extremely stiff on their stalk, and pointing in various directions. Over these the workers are gradually distributed, in small or large groups, as necessary. Presently, several ants at the bases of two leaves attract attention, they having arranged themselves in tandem-fashion, holding one another, and earnestly engaged in pulling from leaf to leaf; further along, between these two leaves, other ants, perhaps four or five, form a string, the central one probably suspended, supported by clinging with her mandibles to the slender waist of the comrade in front, and the one behind gripping her in the same way. Still further along, over the widening space, are other ant-strings, some even up to six inches in length, most of the insects composing it suspended as described. This cable-forming and tugging is soon in operation all over the leaves intended for the future dwelling; consequently, numbers, goodwill, and perfect co-operation, tell; so, gradually, the foliage yields to the pulling force, in due course being in the desired position.

There must be no relaxation, or back the leaves will spring; they must be held, and, as their edges are brought together, the living cables, acting as bridges too, and up or along which numerous workers continually pass as their presence is required at different points, are shortened, admitting of the released ants assisting elsewhere, to pull and to hold, hour after hour, for the long day through, or longer. Surely such sustained tug-of-war action is unknown in any other living creatures; and we find that the suspension bridge, instead of being modern, is of very ancient origin.

Apparently, ants are the sole present and ancient constructors of the living cable, for we learn that the story of the monkeys, which, when desirous of crossing an awkward stream, formed themselves into chains to swing from a tree to the other side, is now discredited. Decidedly it has weak points; in fact, the story is an absurdity.

It may be long after the foliage has been brought into the rounded nest shape ere what we may term the "sewing squads" appear, each individual ant bearing a silk-charged larva, and gently applying its mouth, up and down, to the leaf-margins. The web runs out from all the larvae, until the work is completed. Miles of the threads certainly are required, for it is a stupendous task to fasten down all those straining leaves securely, with threads so fine as to be barely visible. My observations lead me to suppose that, at least, three days are necessary to construct a large nest; but it is next to impossible to ascertain how long the working ants actually remain on duty; for, after the first day, only by patient and careful attention for many hours could one hope to gain the knowledge.

In investigations of nest-building one needs to be wary, not approaching too closely, for numerous and exceedingly alert defenders are there, and from these one is apt to receive a tiny poison-shower in the face, where it does no harm: on the lips it tingles; and in the eye, is extremely painful, since it consists of formic acid. But how can it reach the face? By a sharp forward tilt of the abdomen, it is discharged in a spray, straight overhead, towards the intruder. Should the ants be irritated sufficiently, the jets will be brought into play, and, by observing the insects against the light, can plainly be discerned, shot as from a squirt, with force enough to reach an object seven or eight inches away. These acid discharges operate

freely in all struggles with "big game." I have seen an enormous caterpillar, still wet with the acid, which assisted to kill it, being borne along in triumph by a strong foraging party of green tree-ants.

There are known to me five beautiful blue butterflies that habitually deposit their eggs upon trees over which the green ants hold sway; a rarer species, which, I believe, does also; and a smaller species, whose chrysalids may be found in clusters of twenty to fifty, or even more. Then there are caterpillars of two handsome green moths, and half-a-dozen others, which the ants tolerate, in no way interfering with them. Finally, the caterpillars of the most remarkable butterfly in the world live only in the nests of these ants.

The caterpillars of one of the green moths act in a most peculiar manner, seemingly exhibiting base ingratitude, in return for the protection and hospitality they enjoy, by eating gaping holes in tree-ants' nests under construction. I have removed seven or eight from a half-completed nest, and frequently have observed instances of house-desertion on account of the many holes gnawed by them while the ants were actually holding the leaves down for fastening; yet disengaged builders would unconcernedly run about and over the bodies of these associates, apparently unaware of the damaging nature of their operations. Small perforations are silk-repaired, but, when large or many, no such repairs are attempted; so work ceases, and the locality is abandoned; but the despoilers will follow up and banquet upon the leaves of an early-begun nest elsewhere.

Three of the butterflies mentioned deposit their eggs near the ant-nests or runways, each young larva, with its own silk, twisting or turning over a leaf, or portion of one, to form a shelter, and feeding upon the adjacent greenery. In these abodes the larvae pupate; and, in all cases, larvae and pupae are almost constantly attended by the ants. The fourth species of butterfly selects the terminal foliage of a twig upon which to lay her eggs. The ants exhibit great solicitude for the larvae of this butterfly, by at once webbing them in, the web, at times, enclosing a space nearly equal in size to the body of a small soda-water bottle, the insects feeding in comparative safety within. In these enclosures the pupal change occurs; the butterflies, soon after emergence, passing out

through the apertures used by the ants as thoroughfares. No special care appears to be taken of the caterpillars and pupae of the commoner butterfly, which are unsheltered.

Then there are queer little jumping insects, about the size of a grain of wheat, called Membracidae, to be yarded, or tented in; also aphides, mealy bugs, and various scale insects; so everywhere these stock are impounded with the ever-available and invaluable silk from the ant larvae, perfect harmony existing between the shepherds and their flocks. The hoppers need not be confined, for they can jump or fly off, or walk through the gateways, but elect to stay under their silken canopies, where they are safer than they would be outside. Many of these little shelters may be observed on a favourite ant-tree or shrub; but a sheet of web, as broad as a man's palm, I have seen, stretched over a cherished herd, in the fork of a tree. The web much resembles tissue-paper; upon large fragments I have written quickly and lightly as one would upon such paper, the ink not running into it so freely.

There are numerous butterfly caterpillars and chrysalids that are constantly attended and defended by ants, many of the chrysalids being endowed with the power of producing pleasing ticking and humming sounds, especially noticeable when the ants are moving among them, and if these little "music-boxes" be collected and confined, they can, when quiescent, be "set going" by a few gentle touches with a camel's-hair brush, or a slight tap on the box—they occupy will produce that effect. Undoubtedly these sounds act as messages, indicating to the guardians that all is well, or otherwise, with the senders. Here we have helpless creatures receiving protection from pugnacious and dominating ones; the noises emanating from the former certainly keeping the latter in attendance, for, should a chrysalis die, the ants, by leaving it, plainly they are aware that it no longer possesses life; and as signs of existence are no longer forthcoming, abandonment surely follows.

It has been fairly well ascertained, that certain moths possess the faculty of calling, by means of their wonderfully-constructed antennae, to their fellows some distance away, these calls being received on the antennae of the distant ones, and understood. So here we have wireless telegraphy—as old as the hills, too—which, maybe, obtains freely in the insect world, more particularly in the short-lived moth generally, and some parasitic species of the great wasp families.

The sounds emitted by our butterfly chrysalids may be termed the butterfly-chrysalis-to-ant language, to which, alas! we shall never find the translatory key, though we may form vague guesses as to the meaning of parts of that language, such as, say, their "all is well" when, in response to the gentle antennae-touches of the ants; and of cries of alarm if being subjected to enemy interference, should those custodians be temporarily absent. The latter suggestion is likely to be correct, for, when the chrysalids are being handled, they emit the sounds continuously, and, no matter how held, cannot be silenced.

It has been much debated as to whether ants hear or not; however, we may assume that they do, otherwise what purpose can be served by the noises produced by the butterfly chrysalids (practically all butterfly chrysalids that are true ant-friends emitting them) if they were not to be heard by the ants? So we may take it that they are heard—those ticking and sweetly humming communication sounds, intended only for solicitous guardians, the Green Tree-ants.

SUPPLEMENTARY NOTES.

In the Cairns district, recently, I found many nests of the Green Tree-ant; and in several instances, was able to watch the building and "weaving" operations, so well described by Mr. Dodd. As examples of insect architecture, the nests are less remarkable than those of some other species of Australian ants; it is the methods of construction that amaze the observer.

How tensely the living cables are strung; how patient and determined the workers appear, bringing together leaves that seem as reluctant to meet, in many cases, as the valves of an oyster shell are to open, when the oyster has closed them, in "fear." But wonder increases when, here and there, ants are seen, passing larvae to and fro—between the edges of leaves drawn near together—using living shuttles to weave a most delicate web.

I have touched a nest, in course of construction, and immediately, hundreds of ants became aggressive, running to the ends of twigs and leaves, all around their half-built home; with abdomens up-tilted, like a Blue Wren's tail, and their antennae and front pair of legs waving in the air. The leaf-holding squads, however, did not join the defenders; nor did the weavers cease work for an instant, while I remained, observing at close range.

A nest, at the cost of many bites from the little green furies, was opened, with the object of collecting "lodgers."

Several minute beetles were obtained, and some frog-hoppers; but no butterfly or moth larvae.

It may not be generally known, that Captain Cook was the first white man to observe Green Tree-ants, or, at least, their nests. That was in 1770; and the reference in Cook's *Voyages*, is the earliest record in the literature, of these wonderful insect homes. The habit of using the larvae as "spinners," was first observed by Ridley, at Singapore, in 1890, according to Donisthorpe (*Pro. Ento. Soc.*, London, 1928). He was followed, in 1891, by Saville Kent, in Australia; and by Green, in 1896, in Ceylon. In 1902, our fellow-member, Mr. Dodd, not only confirmed the observations of Saville Kent, but gave further details of the Green Tree-ants' remarkable nest-building habits.

Members of the genus *Ecophylla* are not the only ants which use their larvae in leaf-weaving operations; no fewer than four genera, as Donisthorpe has stated, have separately evolved the habit. Possibly the list will be extended, since we have much to learn yet regarding the habits of ants in the Tropics—and also of ants near home!

C. Barrett.

FOSSIL COLLECTION.

Some 22 members of the Club attended at Glen Iris on May 9, and were met by the leader at the tram terminus, a short walk from his home. The leader explained the different ways in which organisms are preserved in the rocks, showing examples collected locally. The entire replacement of the aragonite of fossil shells in the rocks of the Murray River cliffs by gypsum, and by silica in the form of precious opal in the case of the Stuart Range specimens, was specially pointed out. Then trays containing teeth of sharks and other fishes, mainly from Australian localities, were carefully examined and a comparison made with recent types. The whales and dolphins were represented by teeth, vertebrae, ear-bones and fragments of ribs.

Large collections of shells from the Tertiary localities of Grice's Creek and Balcombe Bay were viewed; these shells, found in soft clay strata, are unaltered save for loss of their original colour, though even it is sometimes partially visible. The types represented, indicate that Victoria had a warmer climate in those days. The party compared this collection with a series of similar age from England. Large fossil Nautilus and Cypraea were seen; the latter (*Cypraea gigas*), is the largest species of the genus known. Specimens of fossil wood were used to show the distinction between the terms "fossilised" and "petrified." Next a series of Palaeozoic and Mesozoic fossils were shown, including ferns from the English and Australian Coal Measures, fishes from Palestine and New South Wales, ammonites, belemnites, etc.

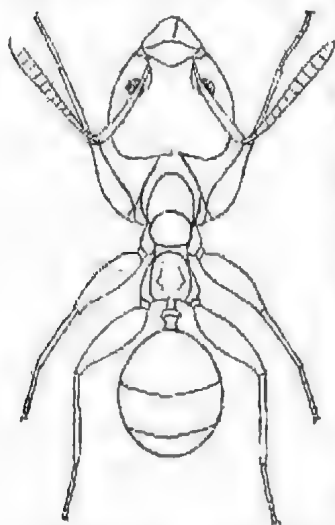
The leader wishes it known that he is always ready to show his collection to members of the Club.—F. A. CUDMORN.

"ANT-HOUSE" PLANTS AND THEIR TENANTS.

BY CHARLES BARRETT.

In my bush-house is a specimen of *Myrmecodia Beccari*, thriving, I hope, and still tenanted by a colony of ants, *Iridomyrmex myrmecodiae*, var. *Stewarti*. It was brought from Cairns, North Queensland, being one of the trophies of a foray among mangroves; an accessible swamp in the dry season, but perilous after the rains begin, and all the area becomes deep in evil-smelling ooze.

Here, among the mangroves, where mosquitoes attack in battalions, *Myrmecodia*, the "ant-house" plant, grows freely; and nowhere else, perhaps, in an extensive district. Mr. A. J. Moran, proprietor of the Strand Hotel, Cairns, who is a keen observer, interested in both plants



Iridomyrmex myrmecodiae,
Em., var. *Stewarti*, Forel.

and animal life, discovered this colony of *Myrmecodia*, and guided me to it—to a lonely, unlovely spot, where few ever go, since it has no charms, except for the naturalist; and its secrets will long remain guarded from tourists and "casual observers." It is rich in orchids, *Dendrobium* species, which grow on the mangrove trunks and branches, often in company of the "ant-house" plant—a contrast, when the orchids are in flower; *Myrmecodia* is a squat, ungainly, bulbous object, tufted—its only grace—with shining green leaves; the flowers are white and small—unnoticeable. Orchids may lure a local resi-

dent occasionally to the mangroves; since there is a constant demand for these epiphytes, in Cairns, for the bush-house, a feature of nearly every dwelling—a fern and orchid garden beneath the bungalow.

Toll of orchids, then, is taken, but none of the raiders troubles to collect a specimen of *Myrmecodia*, though locally it is termed, "onion-orchid," I believe. Lack of beauty is its protection. Free-lodgers are its guardians, too; the ants live in the pseudobulb portion of the

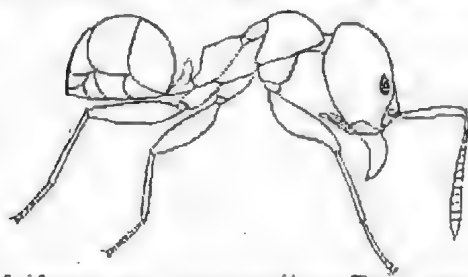
plant, which is further protected by prickles. Truly, a remarkable form; one of the most interesting plants in the world; an epiphyte so closely associated with ant-life that the plant is seldom found, flourishing, without a host of insect tenants, while ants of the species that favour *Myrmecodia*, are confined to *Myrmecodia* dwellings.

The plants, grey and dingy looking lumps, not unlike a dry, bubbly and voluminous fungus, grow in forks of the mangroves, or on the trunks, so firmly attached that a strong knife is needed to detach them. They cling more closely than the orchids do, and seem more parasitical than epiphytic, with a mass of brown, fibrous rootlets, biting into the host-tree's bark and tissues. A touch, and the ants swarm over the *Myrmecodia* plant, coming from darkness into the light, to repel the enemy. Soldiers often are seen on the lookout; or, at least, are the first to issue from the chambers and galleries of the plant, when the community receives a warning of danger. The lightest tap on the pseudobulb of the plant, brings the ants into the open. They attack immediately; and gathering my specimen of *Myrmecodia*, I paid for it in full, being bitten on hands and neck and face by a host of tiny brown furies. The plant, about the size of an infant's head, was tenanted by thousands of ants; and still is the home of hundreds, who survived the journey of 2,000 miles, from Cairns to an Elsternwick garden.

Neither discussions nor field studies, have really solved the riddle of this association between ants and plants, which has intrigued great naturalists, and given rise to theories, expounded in technical language; whereas a rather simple explanation—symbiosis—may be offered for acceptance or not, as you please. It remains a riddle, in so far as we never shall know how the association began. Was the plant modified in structure to suit the needs of the ants; or did the ants, the pioneers of the species, merely take advantage of existing conditions—canals and cavities of unusual character, which, according to some modern botanists, have only a physiological explanation, their function being to contain air, to cool the plant's tissues during extremely hot, dry weather; and at other seasons, absorb and hold water to aid growth, naturally.

So the botanists and some noted biologists, of the sceptical school, as regards myrmecophily, contend that there is no real symbiotic relation between the "ant-house" plants and their tenants. The plants are able to thrive without the aid of insect lodgers in their pseudobulbs; while the ants commandeer the cavities without either injuring or benefiting *Myrmecodia*. That is the modern view of the matter; and must be considered as fairly probable. Probable because, as Treub discovered, the cavities in the pseudobulb arise naturally, in very young examples of *Myrmecodia*, and are not produced by ants. It is admitted, however, that the ants may enlarge these chambers, of all shapes and various sizes. And a very young plant, which I examined, was already an ant-dwelling.

They say, the sceptics, that their case is strengthened by the fact that no enemy of *Myrmecodia* has been discovered — no bird attacks it; no animal covets it as food. Well, this is merely negative evidence. There may be enemies, of which we have no knowledge. The more we learn about Nature's ways, the smaller seems our little



Iridomyrmex myrmecodias, Em., var.
Stewarti, Forel.

store of knowledge. Certainly, the ants, not for the plant's sake, but their own, rush from the "trenches," when their vegetable-home is even touched by an intruder. If the plant has enemies, its tenants are bold and efficient guardians of its safety.

Wheeler, in his admirable discussion of the relation of ants to vascular plants ("Ants," Chap. XVII, 1913), remarks that the "case of *Myrmecodia* and the allied Rubiaceae, is very interesting, as epitomizing the change of opinion which will eventually extend to other instances of so-called symbiosis between ants and plants." And he recalls the fact that Rumphious, in 1750, declared *Myrmecodia* to be a zoophyte, in the belief that the ants gathered twigs and with them built a nest, out of which the plant germinated.

Myrmecodia and its tenants deserve further scientific investigation, in the field and by "control" methods. The "plastic ant," adventurous and enterprising, is not the least amazing in its association with plants, which seem to have been created for its benefit chiefly, or to have evolved, as a reward for benefits bestowed, structures which excite our wonder and invite logical explanation.

Beccari, who has published a notable memoir (*Malesia*, Vol. II.) on these "hospitating plants," as he terms *Myrmecodia* and *Hydnophytum* (each comprising numerous species), at first thought that the ants, by invitation, "favoured the swelling of the base of the stem, and were a direct cause of such an hypertrophy," in young budding plants of *Myrmecodia*. Further research and investigation, and the observations made by Dr. Treub, convinced Beccari that, "from the very beginning, these swellings appear independently of any action of the ants, and that when the latter are absent, the tubers develop in much the same manner." But he does not think it equally certain that ants have no part in the formation of the internal galleries. As he expresses it, and as anyone who has made observations on the plants as they grow must believe, the hospitating species of *Myrmecodia* and *Hydnophytum* "live on a footing of reciprocal utility or mutualism with their inhabitants, which act as a formidable army of defence." (*Wanderings in the Great Forests of Borneo*, Append., p. 405).

Ant-harboring plants, highly specialised like *Myrmecodia*, are not found in Victoria, and it is worth a trip to the Tropics, to see them in their haunts; to suffer torment from mosquitoes, among the mangroves, where, too, you may find the "golden" orchid, a species of *Dendrobium*, and where the black slime glistens by the sea, surprise a walking goby (*Periophthalmus*), enjoying its siesta, but alert as a "sleeping" sun-lizard. Seeking one thing, you find many. Among the mangroves, across the inlet from Cairns, a naturalist's gleanings may include more wonders than *Myrmecodia*, though none, perhaps, more wonderful than this ungainly, puzzling, and "gouty"-looking plant, whose fresh leaves fall as easily as the petals of a full-blown rose.

It is of interest to note that the introduced "pest" ant, *Pheidole megacephala*, has taken to dwelling in *Myrmecodia*, and probably is encroaching steadily on the rights of the "original inhabitants," as the starling is dis-

possessing native birds in Victoria of nest-hollows in the Eucalypts and other trees! *Ph. megacephala* is an Old World species which has extended its range to many lands beside Australia—it is one of the conquerors, as successful almost as the sparrow.

I am indebted to Mr. John Clark, F.L.S., entomologist, National Museum, for the drawings which illustrate this article; also for identifying the ants of my North Queensland collection.

WILD FLOWER SHOW.

In connection with the Annual Wild Flower Show to be held in the St. Kilda Town Hall on Tuesday, 2nd October, the Committee appeals to members (especially in the country districts) to assist by forwarding supplies of flowers. Offers of assistance on the day of the Show are also invited.

It has been decided, this year, to supplement the Flower Show by a collection of Natural History exhibits, in addition to the usual display of microscopes, and any member who is prepared to help in this direction by the exhibition of Natural History objects, or the loan of microscopes, is requested to notify Mr. V. H. Miller, Assistant Hon. Secretary, and Miss J. Raff, respectively.

Flowers should be packed in boxes lined with damp paper, and despatched in time to reach Melbourne on the evening of Monday, October 1st, except in the case of trains reaching Melbourne before 10 a.m. on Tuesday, e.g., the Adelaide express.

Boxes should be marked "Cut Flowers, PERISHABLE," and addressed to—The Hon. Secretary, Wild Flowers Exhibition, Melbourne.

Labels can be obtained by applying to the Hon. Sec. The name and address of the sender should be plainly marked on the outside as well as enclosed inside the packages, with a figure denoting the number of packages sent. Freight will be paid at Melbourne. Communications should be addressed to:—Mr. L. Hodgson, Hon. Sec. Field Naturalists' Club, c/o Mr. G. Coghill, 79 Swanston-street, Melbourne.

SHOCK, OR SIMULATION?

In the *Memoirs of the Queensland Museum*, April, 1927. Mr. A. M. Lea, F.E.S., described a number of small Weevils belonging to the genus *Storans*. These are remarkable in having a peculiar structure of the prosternum, which is best described in Mr. Lea's own words: "On each side of the prosternum of all the species of *Storans* there is a fovea that is usually fairly deep, and has at its bottom a very thin membrane, through which an eye can look when the insect has its rostrum resting in the pectoral canal; on some of the species the depression appears as a fairly large round fovea, on some it is semi-double, on others it appears as a thin curved furrow; it undoubtedly serves as a 'peep-hole' . . . for the beetle, when all its appendages are contracted together." Does not the presence of these convenient "peep-holes" suggest that the beetles, when contracted, instead of being unconscious from shock, due to fear, as some naturalists maintain, are very much alert and literally "keeping a weather eye open" until the danger has passed.

THE LILIES OF VICTORIA.

BY H. B. WILLIAMSON, F.L.S.

Part V.

Genus CHAMAESCILLA.

Greek, *khamai*, dwarf; *skilla*, squill, or the sea-onion of the Mediterranean.

CHAMAESCILLA CORYMBOSA (R.Br.), F.v.M. Blue Squill.

Fig. 1.

A small plant, with slender tubers, radical, grass-like leaves, and a flower stem about 4 inches high, bearing a corymb of bright blue flowers, with 6 small yellow anthers on slender filaments. Petals and sepals 3-veined, spirally twisted after flowering. A pretty little lily, very common in all parts of the State, and in all other States but Queensland.

Genus CAESIA.

From *Casi*, an Italian Naturalist.

CAESIA VITTATA, R.Br. Blue Grass-lily. Fig. 2.

A plant with slender tubers, grass-like leaves and flower stems from 6 inches to a foot in height, with flowers along the upper half in clusters of from 2 to 4, provided with scarious bracts at the base of the pedicels. Flowers resemble those of *Chamaescilla*, and are twisted after flowering, but the inflorescence is a raceme with numerous flowers, and the petals and sepals have a darker veined centre. Common in all districts, and found in all States but W.A.

CAESIA PARVIFLORA, R.Br. Pale Grass-lily.

This is closely allied in every respect to *C. vittata*, the only distinguishing characters being smaller and paler flowers, and less robust habit. Its habitat, moist, heathy ground, would seem to account for these differences. I consider that it scarcely deserves the rank of a species. Widespread in Victoria and in all States.

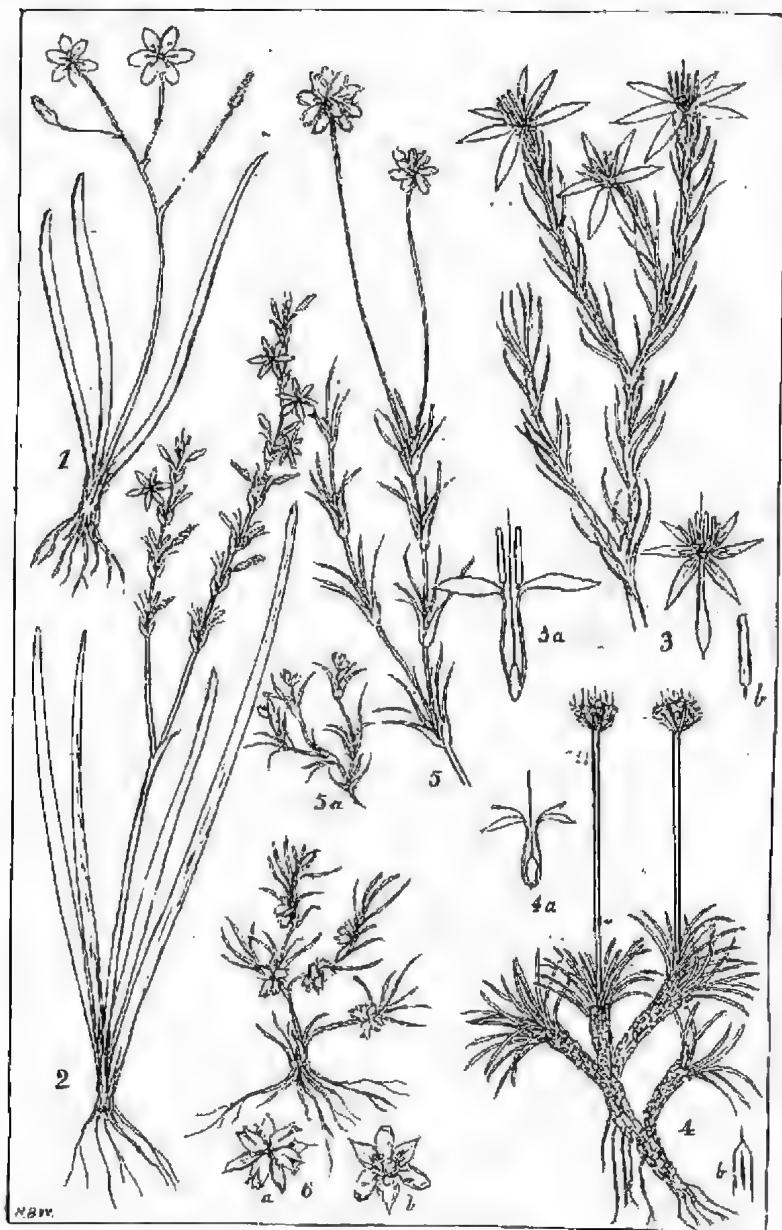
Genus CALECTASIA.

Greek, *kalos*, beautiful; *ektasis*, development.

Like *Lomandra* and *Xanthorrhoea* this genus, comprising only one species was included by Benthams in the family *Juncaceae*.

CALECTASIA CYANEA, R.Br. Blue Tinsel Lily, Fig. 3.

Plant about a foot in height, with its numerous branches covered with imbricate leaf-sheaths. Leaves linear, about $\frac{1}{2}$ inch long, their sheaths broad and clasping the stem. Flowers singly terminal, large, with a



1, *Chamaescilla*. 2, *Caesia*. 3, *Colectasia*. 4, *Borya*.
5, 6, *Bartlingia*.

perianth consisting of a narrow, rigid tube with 3 outer spreading lobes (sepals), and 3 inner ones (petals). These lobes are rigid, much pointed, and usually of a shining metallic blue above, paler beneath. Anthers (3b) are long, erect, bright yellow, and are attached by short filaments to the base of the perianth lobes instead of below the ovary at the bottom of the perianth tube. It is common in the Grampians, from which it extends through the Mallee and South Australia to West Australia.

Genus BORYA.

Represented by only two species, one of which is a Queensland plant; and the other, *B. nitida*, confined to West Australia until in September, 1924, Mr. C. D'Alton discovered it in the Grampians ("Wonderland") in this State. Its occurrence there, so far from its original home without any record from the intervening State is remarkable, seeing that the idea of its having been introduced by human agency can scarcely be entertained.

BORYA NITIDA, Labill. Pincushion Plant. Fig. 4.

A densely tufted perennial, up to about 6 inches high, with rigid, linear, pungent leaves (b), crowded at the summit of the branches, which are covered with the persistent leaf-bases, and which occasionally produce roots from above ground. Flower heads, which remind one of those of *Juncus falcatus*, are about $\frac{1}{2}$ inch in diameter on erect, rigid scapes. The outer bracts, 3 to 7, are rigid and pointed; inner ones broad, dark brown. Like *Calceolaria*, the flowers have a tubular perianth with spreading, persistent lobes, but these are small, white and membranous. Stamens are inserted at the base of the perianth lobes, and are about as long (4a). Styles long, giving the flower heads the fanciful resemblance to small pincushions, hence the vernacular name.

Genus BARTLINGIA.

--After Bartling, a German botanist.

BARTLINGIA GRACILIS, R.Br. Silverweed Lily. Fig. 5.

Stems slender, branching, forming loose tufts 6 inches to 1 foot high. Leaves linear, about $\frac{1}{2}$ inch long, crowded at intervals of about an inch along the stems, their bases sheathing and scarious, with a few woolly hairs on the margin. Flower heads resembling those of *Sowerbaea juncea*, but rather paler, on slender peduncles of several inches, 4- to 10-flowered. Bracts few, very thin and transparent, entire and glabrous. Flowers pink, with petals nearly $\frac{1}{2}$ inch long; sepals rather shorter.

Occurs at the McAllister River and Mt. Lizar (?), Mueller; Sale, H.B.W. Also in N.S.W. and Qld.

Under this species must be included:—(a) Specimens collected by Reader in "County Follet, Nov., '05," with peduncles from $\frac{1}{2}$ inch to 2 inches; (b) specimens from the summit of Mt. William, H.B.W., with peduncles $\frac{1}{2}$ to $\frac{3}{4}$ inch long; and (c) specimens from Mt. William, 5000 ft. (?), Mueller, a dwarf form about 1 inch in height, which might be placed as var. *nana*, Fig. 5a. In the smaller forms the number of flowers in a head is reduced to two or three, or even to one.

BARTLINGIA SESSILIFLORA (Dene), F.v.M. Nodding
Silverweed Lily. Fig. 6.

Differs from the preceding in having sessile clusters of flowers. A small perennial, 2 to 4 inches high, with wiry, branching stems, and leaves similar to those of *B. gracilis*, but usually somewhat longer. Flowers few, sessile in axillary heads, surrounded by a number of scarious bracts; the inner ones white and woolly at the base. It is recorded from all districts but the N.E., and from all States but Queensland.

CORYNOTHECA LATERIFLORA, F.v.M. Sand Lily.

Mueller gathered this plant in 1853 on sand hills near the Murray River at Mt. Dispersion in N.S.W., and as it has never been found on this side of that river, it must be deleted from our Census. It is a plant with numerous, rigid, divaricate branches, with somewhat the habit of *Tricoryne*, but its filaments are not bearded, and the flowers are minute, petals being about $\frac{1}{8}$ inch long. Fruit an obovoid nut, with two abortive cells forming a protuberance along one side.

EXCURSION TO EAST RINGWOOD.

The excursion to East Ringwood on Saturday, July 28th, was well attended. A ramble of about two miles was taken, in a south-easterly direction, over undulating country. Few flowers were seen; the most noteworthy being the white variety of *Epacris impressa*, which was plentiful, and in good condition. Only one orchid, the Blunt Greenhood, *Pterostylis curta*, was met with. The first flowers of *Acacia myrtifolia* were just appearing. This is one of the best of the smaller species for garden cultivation. The flowers are of rich colour, their perfume is not too heavy, while they last well when picked.—F. G. A. BARNARD.

ERRATA.—August "Naturalist," page 91.—In exhibit by Mr. J. Searle read "*Chaetognatha*" instead of "*Chaetognathus*"; and read "*Krohnia*" instead of "*Knotmna*."



ORIENTATION IN ANIMALS.

There is no lack of literature nowadays, on the chief problems set by the facts of social life among the insects, of animal behaviour in general, and of such fascinating subjects as orientation in birds and bees, and other animals. Bird migration has attracted some of the greatest philosophic naturalists; and insects that possess the "homing sense," have been studied by keen intellects.

One of the latest books dealing with distant orientation and place-recognition is Etienne Rabaud's "How Animals Find Their Way About," a volume of Kegan Paul, Trench Trubner and Co.'s International Library of Psychology, Philosophy, and Scientific Method. Rabaud is Professor of Experimental Biology in the University of Paris, and one of the leading French naturalists. He has, in the work under notice, given us an admirable introduction to an important branch of animal psychology. He discusses, in a lucid manner, facts and theories; summarising our knowledge of distant orientation among both the flying and the walking insects, molluscs, etc., and vertebrate animals.

The book is a challenge as well as a study; a temperate, learned, yet very readable volume, wherein nothing is affirmed which does not rest upon positive proof. The challenge, or the invitation rather, is to further research, for we have yet to arrive at a solution of the major problem. There is, to quote the author, hardly any sign of a "special" sense in animals that find their way about. He concludes that "memory plays a very important and probably a preponderant rôle in the process of orientation."

Those members of our Club who are interested mainly in the Hymenoptera, should read, as well as Rabaud's book, W. M. Wheeler's latest work, "The Social Insects," issued also in the "International Library." Professor Wheeler visited Australia some years ago, and has described many new species and varieties of Australian ants, and published notes on the habits of some of the most interesting forms. His latest work deals with the origin and evolution of ants, wasps and bees, and termites.

KOMODO DRAGONS.

When Sir Allan Cobham made his memorable flight from England to Australia, his statement to the press that "he had seen 'real dragons' at Bima excited much interest both in England and Australia. The habitat of the large carnivorous lizard, known scientifically as *Varanus komodoensis*, is mainly in the small island of Komodo; one of the chain of islands extending eastward from Java, known as the Lesser Sunda Group, and terminating in the large Island of Timor. Timor, being only about twice as far from the Australian coast as Tasmania is, and the marsupial fauna extending into the group, these largest of land lizards should be of special interest to Australian naturalists; the more especially as their close relationship to living Australian species has been proved.

Varanus komodoensis was known to science at least some 15 years before Cobham saw it. It appears to have been first described by the Dutch naturalists, Ouwens and De Rooij, in 1912 and 1915 respectively. The Duke of Mecklenberg collected four specimens in 1923, of which three are at present in the museum at Buitenzorg, Java, and the fourth in Berlin.

The Komodo dragon is simply a super-Goanna, practically differing only in size and coloration, the latter being a uniform dull black, and showing none of the markings of the Australian *Varanidae*.

The islands of the group in which Komodo is situated, are of comparatively recent volcanic formation, and Dr. E. R. Dunn, heysetologist with the Douglas Burden Expedition to Komodo, in 1926, therefore regards Australia as the country of the origin of *V. komodoensis*. The evidence further shows that the near relations of the species occur increasingly eastwards towards Australia, and become much less distinct on the western side of the group towards Asia. It would thus appear that the ancestors of the dragons, migrating slowly through the ages from Australia, did not survive to the west, beyond Komodo.

ETHNOLOGICAL SECTION.

The monthly meeting of this Section was held at Latham House, 234 Swanston-street, on August 21st. Mr. A. S. Kenyon occupied the chair, and about 30 members and friends were present.

Dr. S. Pern, with the aid of an illustrative series of drawings and charts, took a comprehensive survey of the presence of man upon earth, as revealed by human remains and the artefacts found in conjunction with the bones of animals in remote ages. Comparison was made between the typical human skulls of different periods, and the stages of development, as shown by ethnological research. The conclusions arrived at in regard to the origin and diffusion of the human race were submitted.

An interesting discussion followed, the various points raised being satisfactorily dealt with by the lecturer, who was accorded a hearty vote of thanks for his capable presentation of the subject.

The next meeting of the Ethnological section will be at Latham House on Tuesday, September 18th, the subject being, "Australian Aboriginal Art," by Mr. Chas. Daley. All Club members are invited.

COMMON ALIEN PLANTS.

There are many enthusiasts who botanise, while walking along the streets, or while standing on a railway platform waiting for a train; some even who study the flora growing on a vacant allotment, for where may a floral friend not be found? To such, the time has come when it is not so much that which is native to a country, but what can be found growing in it, whether endemic or alien. Then why not include, in its rightful place in the plant list of our *Census of Plants of Victoria*, any plant, whether of native or introduced origin, as is done in plant lists of some of our sister states?

Our native plants, in many cases, are fast disappearing, like other aborigines, before the white man; and we must educate those around us to know all plant life, for good or ill, no matter what its origin. Excepting the scientist, what man in the country cares whether the plant be a native or not. He is more concerned with its properties, and requires to be able readily to recognise it, and, if necessary, keep it in check or encourage it. As a town lad, the first plant almost to arrest my attention was the common Flax-leaved Fleabane, *Erigeron linifolius*. It grew on a vacant allotment near my home; and is one of the commonest of weeds. Imagine my surprise when, recently, a grey-haired man, born and living nowhere else than in country and pastoral districts, having many thousands of sheep in his charge, to say nothing of cattle and horses, asked me what this species of plant was. He remarked that he, and other members of the Committee of an Agricultural Society, had noticed it growing on their show ground; and each gave it a different name, and ascribed various properties to it. Is there not reason, therefore, to educate people on all plant life, and not limit consideration to the native plants of the State in which we dwell?—A.J.T.

BIRD ENEMIES OF SCALE INSECTS.

Scale insects which infest the Peppermint Gum, *N. piperita*, form the chief food of our Bell Miners, *Manorhina melanophrys*. Very long ago, the swamps in the Lardner district were the home of many Bell Miners. Clearing the land made a great difference to these birds, and they disappeared to return to permanent water nearer Dronin township. Later they multiplied so that fresh fields must be found, and summer after summer, a few came and stayed with us for the nesting season.

Then we discovered that their bathing pool was in an old log that had been burnt out, and used as a feeding trough for cattle. The secret of keeping the birds here permanently was known. We kept water in that log (many birds bathe there), and later they became so numerous that they "overflowed" to the garden (which is a dense mass of trees and shrubs). Here a bowl of water was kept for them, and we have counted 50 Bell Miners just about it.

Our beautiful bush was ravaged by a fire which had travelled six or seven miles; and afterwards the birds had a bad time. I tried putting honey and sugar in tins on trees; but the birds died in numbers. Later a great many found their way further on. Bell Miners are still about the doors, but the peppermints have died from the effects of scale, and we think that, but for the honey-insects in the garden, we would lose our bird friends completely.—(MISS) C. C. CURRIE.

WINTERING OF THE SEA-CURLEW IN AUSTRALIA.

It was in 1926 that I first noticed that the Sea-Curlews were wintering here at Corinella, Western Port. Again, in 1927, they stayed all the winter, and they used to feed right in front of my place nearly every day. They are again here, in June, 1928, but this year I have not seen them feeding in front of my place, facing Phillip Island, but on the beach facing French Island.

In regard to the species breeding here, I know that two young birds were shot. A friend of mine shot two old ones and one young bird. I asked him how he knew it was a young one. He said because it had pin feathers on it, and the bill was about three-quarters of an inch smaller, and the body was a good deal smaller than that of the old birds. I asked him what he did with them. He said that they had been eaten; he never thought that they were so scarce. That was at Easter, 1927; on the same night another young fellow also shot a young one. What he did with it I don't know.

I really believe that the species nests some two or three miles from here. Some ten or twelve years ago, in April, I heard the Sea-Curlews screaming high over head. I watched them for three or four minutes, circling and screaming, and other curlews joining in, and then, when they were very high up they shot off to the north.

This winter I have noticed the Curlew Sandpiper for the first time. There were 30 or 40 in the flock, so they are evidently changing their habits also.—H. HUGHES, Corinella, Western Port.

SPRING AT RED CLIFFS.

Now that the sap is rising in the vines, the vineyards are visited by Red Wattle-birds, and other honeyeaters, all eager for refreshment. At present the sap is dripping from cuts and fractures in the wood, and the birds are very fond of this.

The Short-billed Honeyeaters in this district are evidently aware that evolution has treated them unkindly, so they perforate a small hole at the base of bell-shaped flowers, and easily secure the sweets. This dodge, by the way, is not confined to the little short-billed species, and in Melbourne I have known even the Spine-billed Honeyeater to resort to a similar procedure, in the case of very deep flowers. Evidently, there are many short-cuts made by Nature's creatures in the "struggle for existence," and the ways of evolution are beset with troubles.

Scores of Black-faced Cuckoo-shrikes have made regular visits to the vineyards, and there has been a considerable decrease in numbers of the big grasshoppers that survive the winter frosts. These fine birds look particularly attractive at close quarters, and their dainty habit of adjusting the position of the wing feathers after a flight is then soon to advantage.

Game birds are passing out rapidly in the Murray Valley. Game laws are flouted every day. We must agitate for a National Park that embraces Mallee and Murray flats, and the Hattah Reserve would probably be ideal for the purpose. In addition, at least two inspectors with a motor-car or cycle, should be permanently stationed in this district.—L. G. CHANDLER.

FLOWERING SEASON OF NATIVE PLANTS.

It is only when we grow them in the garden, where every change of growth is watched and enjoyed, that we realise the long flowering season of some of our Victorian plants. A few, like *Dawsonia rubicunda*, bloom for several months, then, through all the rest of the year, open bright, unexpected flower-eyes at intervals, to remind us that the spring will come again. Many species bloom for one, two, or three months every spring, then rest in brown and green until the spring of the next year, but a few bloom for six months, or more, every year. On October 19th, 1927, I had a *Bulbine bulbosa* in full bloom, and it flowered cheerfully, in spite of heat and heavy rain, until June. On June 22nd, the last flower began to fade, but already (August 8th) the plant is sending up another strong flower-stem. I have had the graceful 'Pale Vanilla' Lily in bloom from October until May, and *Correa rubra* from April to November. This last shrub, the badge of our Club, is a particularly useful garden plant, for it is loveliest in July, when it keeps a spot in the garden aglow with scarlet when brightness is most needed, when autumn is past and the spring has not come.—J.G.

BEHAVIOUR OF YOUNG ECHIDNA.

Rarely is a very young Echidna or "native Porcupine," *Echidna aculeata*, seen; and but little is known respecting the early life of the species. In August last, a living example, about a week old probably, was brought to me, by a resident of Somerville, who said that he had observed scores of adult Echidnas, but never before a young one.

The infant monotreme, naked and with unopened eyes—though they were plainly discernible as black dots through a "film"—was cold to the touch, as a snake is, but so active that it was a most difficult subject for the camera. It squirmed and clambered over my hand, tried to burrow into the palm, and sometimes rolled itself into a ball, as the adult animal often does, in face of danger. In the tin in which it was carried to Melbourne, the young Echidna burrowed in loose, dry earth, using its soft, slender beak, and its weak but fairly sharp little digging-claws, after the approved Echidna manner.

Most surprising was the energy of this very young creature; its persistent efforts to clamber and burrow. It came from a "nursery" in loose sand, beneath a clump of Heath, *Epacris impressa*, but Cranbourne way, being discovered by a dog, whose owner saved the interesting "baby." There was no sign of its mother; and the burrow was closed when it was found, and lacked even a dead leaf or grass bent, as lining—the most primitive "nest" imaginable—or was it only a temporary "day-nursery."—C.B.

THE MEADOW MOONWORT.

At the Club meeting in October, 1927, I gave some account of the rather rare fern, *Botrychium australe*, R.Br., known as the Meadow Moonwort, and my experiences with the same plant over a period of forty years (Vic. Nat., Nov., 1927, p. 197). At that time the plant was dying down, previous to its resting period. The first sign of its forty-first season's growth appeared on February 8th last. In two months it had attained its full size, as exhibited at the Club meeting in June. It measured 16 inches in height, rather taller than usual, probably because its position in my shade house was not quite so well lighted as previously. Next year I think of trying it in the open.—F. G. A. BARNARD.

ETHNOLOGICAL NOTES.

It appears to have now been demonstrated that Neanderthal man appeared in Great Britain before the glacial period. According to J. Rend Moir, the stone implement clay beds of Hoxne, Suffolk, lie below a thick layer of glacial boulder clay. On top of this are found tools of a more advanced type, then again a cold-period bed, and above this the present surface with new Stone Age relics.

We have been waiting for a long while to read of the discovery, in other parts of the world, of the chipped pebble axe, the dominant chopper in all parts of Eastern Australia, where suitable pebbles are readily accessible. Examples have actually been coming to light, for some time past, in the Columbia Valley, U.S.A., but they have heretofore been ignored, or merely called "scrapers." Mr. Julian H. Steward, of the University of California, now suggests that they are "throwing stones," or missiles. The illustrations given show that they are identical with our choppers in every way.

The Stone Age is now Eolithic, Palæolithic, Mesolithic, and Neolithic. The Mesolithic embraces the Azilian, the Tardenoisian and the Maglemoeran. But the Azilian cannot be separated from the Upper Palæolithic. The recent researches of Erik Westerby, the Danish prehistorian, into the Maglemoeran station of Bloksbjerg, demonstrates that its culture passes over without a break into the Neolithic period. So we have no longer a gap to be bridged from the Palæolithic to the Neolithic. Overlapping of cultures is also being freely discovered. It is time more attention was paid to the undisturbed evolutionary cultures of the Australian, and less to the migrant and heterogeneous remains of Europe.

Another controversy has risen. The chipped stones of the Sligo coast, Ireland, described by J. P. T. Burchell as of the Early Stone Age, have been declared to be merely accidental. The reasons given by a committee of investigation are, first, that the caves are of much later geological date than the 'Old Stone Age'; and, secondly, that the chipped stones are of limestone, a most unsuitable material for implements. This is an instance of a remarkable confusion of ideas, the mingling of geology and archeology without warrant. The Lower Murray aborigines used a limestone freely for chipped implements, as did many other of our tribes.

Vol. XVI., No. 5, of the *Records of the Australian Museum*, Sydney, is devoted entirely to ethnology. Ethnological Notes by W. W. Thorpe, with twelve plates and a map, describes a number of crude stone implements, stone mills, a doubly-grooved conical implement, which Mr. Thorpe thinks comparable to the cylindro-conical stones of the Darling River, but which is exactly like the grooved implements of Goulburn district, and resemble our northern Victorian and Western District grooved implements; a remarkable bone implement, which may be anything; a jinkée or medicine man's magic stick from Cue, W.A., of Churinga relationship, and other items.—A. S. KENYON.

SHELDUCK AS A PET.

One seldom hears of a Shelduck, or Mountain-duck, *Tadorna tadornoides*, being kept as a pet; yet, once domesticated, this species will not only become as tame and affectionate, but also as useful, as the household cat. From personal experience, however, we have concluded that the rearing of ducklings, from their wild state, is not a practicable project, they are not hardy, and many losses occur. It is possible that, if eggs were obtained and incubated under a domestic duck, or a hen, better results would be achieved.

Some years ago, we captured a brood of 12 Mountain-ducks. Only one lived. When feathers began to take the place of down, it was obvious that our sole survivor was a male bird. He soon became accustomed to the food given him, and to the strangeness of farmyard life, and began to show signs of vigorous growth. It was not long before "Tommy" was as quiet as the domestic ducks, and more confiding. At meal times he would, occasionally, waddle around the table, and "beg" for a piece of cake or other dainty.

During the day "Tommy" was permitted to roam about the gardens and enclosure round the house, where he did good service in destroying caterpillars and other pests; one wing, of course, was kept clipped. At night-time he was shut up with the domestic ducks, or hens. Many a fowl lost some tail feathers as a result of annoying the Shelduck, for he was ruler of the fowl-yard; even the ducks decided that it was safer to keep on friendly terms with their "wild" relative.

The Mountain-duck received food similar to that supplied to the fowls; he was especially fond of wheat, but preferred to take it from one's hand rather than from a dish. Three other Mountain-ducks were subsequently reared, but "Tommy" was always the favorite. Some time later our pet was the only occupant of the fowl-yard. Feeling lonely, however, without his feathered friends, he sought friendship with the dog—a collie—which did not object to a companion, in spite of the fact that his drinking water was continually transformed into a mixture of mud and feathers through the agency of "Tommy's" dabbling bill.

The Mountain-duck was an effective watch-dog; when a stranger appeared he would assume a ferocious attitude, and, with head erect and feathers ruffled, would follow the visitor round the garden and orchard, frequently uttering his deep, hoarse notes. When displeased, he was ever ready to inflict a sharp nip with his bill just above one's boots. He willingly accompanied us for a bathe in the lake, but never cared to remain for long in the water. After about 12 months he became so attached to the members of the family that he was regarded as one of the household; it was chiefly through his affection towards us that we finally lost him. One day, when we were all absent from home, "Tommy" disappeared. Evidently he decided to follow us, and had managed to squeeze out under the gate. Doubtless he soon met his fate, falling an easy victim to a fox, or to a sportsman's gun.—FRED. BARTON, Jnr.

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THE FIELD NATURALISTS' CLUB OF VICTORIA.

The ordinary monthly meeting of the Club was held, in the Royal Society's Hall, on Monday, September 10th, 1928. The President, Mr. F. E. Wilson, F.E.S., occupied the chair, and about 90 members and friends were present. In the absence, on holidays, of the Hon. Secretary, Mr. L. Hodgson, his place was taken by Mr. Geo. Coghill; while Mr. Blake acted as Minute Secretary, Mr. H. B. Williamson being absent on plant survey work, at Canberra.

REPORTS.

Reports of excursions were given as follows:—Hurstbridge, Mr. A. J. Tadgell; Boronia, Mr. Paton; Wattle Park, the President.

ELECTION OF MEMBERS.

The following were duly elected as ordinary members, on a show of hands:—Miss Marjorie Smith, Epworth Hospital, Erin-street, Richmond; Messrs. G. Joliffe, 46 Andrew-street, Windsor; Clive Grant, 161 Richardson-street, Middle Park; R. Halliday, 29 Spring-street, Malvern; and T. C. O'Neill, 73 Caroline-street, South Yarra.

GENERAL.

The President mentioned that the 89th birthday of Mr. C. French, senr., was that day being celebrated, and a motion was carried that the Acting Secretary convey the Club's hearty congratulations to him.

LECTURETTE.

Mr. C. Daley, F.L.S., gave a short address on the stone axes used by Victorian aborigines. A fine series of specimens was shown. Mr. Daley also read a short paper, by Mr. A. S. Kenyon, on the same subject.

EXHIBITS.

By Mr. A. S. Kenyon.—Stone axes, etc., from Australia, America, Melanesia, etc., and a case of stone implements from Tasmania, and one from New Zealand, in illustration of his paper.

By Mr. C. Daley, F.L.S., stone axes, etc., illustrating his lecturette; also, from his home garden, flowers of *Thryptomene calycina*, and other native plants.

By Mr. H. P. McColl.—Flowers from his garden, of *Hurdenbergia monophylla*, both *alba* and *rosea*, and other native plants.

By Mr. C. Borch.—Four species of Victorian Lycaenidae—*Miletus delicia* (Moonlight Blue), *M. hecattus*, *Ogyris olans* (Mistletoe Blue), and *Ogyris abrota* (Scarce Mistletoe Blue).

By Mr. F. E. Wilson, F.E.S.—Five species of Jewel beetles from East Indies, *Chrysochroa* genus.

By Mr. Harold Smith, per Mr. H. B. Williamson, F.L.S.—Wildflowers from a patch of Mallee, 10 miles S.W. of Horsham.

By Mr. Chas. Barrett, C.M.Z.S.—“Ant-house” plant, *Myrmecodia Beccarii*, from Cairns; and ethnological specimens from N.W. Australia.

By Mr. A. E. Opperman.—Flowers from his garden, of *Glianthus Dampieri*, *Stypandra glauca*, and various orchids.

By Mr. F. G. A. Barnard.—Cherry Ballart, *Exocarpus cypressiformis*, in fruit.

By Mr. F. Pitcher.—Rhodesian Mahogany bean, *Azelia cuauzensis*.

By Mr. V. H. Miller.—*Corysanthes fimbriata* and *Pterostylis alpina*, growing specimen of *Dendrobium æmulum*, White feather Orchid, from Queensland; also fruits of *Kigelia pinnata*, *Dillenia indica*, and *Tuffa acutanquila*, and Seed-pods (18in. long), of *Poinciana regia*, and of *Spathodea campanulata*.

EXCURSION TO HURSTBRIDGE.

Nearly 50 members and friends took part in the ramble over the hills and dales at Hurstbridge on August 25. The season being abnormally dry, the Western slopes were not found so interesting, as the Southern and Eastern slopes, and even these latter were suffering from lack of rain. The day was cool and cloudy at times, but bright sunshine at others. A large number of the excursionists vied with one another in recording finds, which were duly named and explained. The leader also gave those assembled some notes of general information about Acacias, with more particular reference to those growing around Hurstbridge, of which there are at least 14 species—many of these were found in flower. Of the 90 species of plants recorded during the outing, 53 were found in flower, of which eight were orchids. To a number who had not seen the *Ophioglossum coriaceum* growing, the fruiting spike was of some interest.

KITCHEN MIDDENS ON THE MORNINGTON PENINSULA.

BY R. A. KEBLE.

By roughly classifying the surface of the Mornington Peninsula into sand and clay areas, we find that what may be conveniently termed the Tyabb Sands, extend from Langwarrin to Coolart, between the Stony Point railway and the Western Port Bay; and, similarly, the Tootgarook Sands comprise the whole of that part of the Peninsula between Bass Strait and Port Phillip Bay, west of the Wallermeryong, south of the Toom Toom Allock, and west of a line from the Toom Toom Allock to Dromana. With two exceptions, these are the areas on which the aborigines have left abundant evidences of occupation, in the shape of kitchen middens, spoil heaps, etc.

In striking contrast to the sand are the clay areas, comprising most of the remainder of the Peninsula. On them, traces of the blacks are rare, or entirely absent; notwithstanding the existence of permanent creeks, not one kitchen midden or native camp can be instance'd. Those kitchen middens between Coolart and Flinders, at the edge of the basaltic clays, are on sandy raised beaches. It is striking proof of the blackfellow's preference for sand, that the kitchen middens situated within the clay area, namely, those on the Mount Martha pre-emptive right, and Yaen Yaen, are on patches of white sand; off these patches, not a trace of aboriginal habitation can be found.

There are, however, two sandy tracts that contain very few traces of the blacks, one on Sandy Point, and the other on the ridge on the west side of the Wallermeryong parallel to it, and between the Toom Toom Allock and Blacks' Camp. The ridge is flat-topped, with many swamps scattered over it, but none of them is permanent; the same may probably be said of Sandy Point.

It is usually difficult to ascertain whether the water in a swamp was formerly permanent or not. The appearance of the rabbit converted most of them into mere soaks, for when the water retired during the dry months, rabbits burrowed round the water's edge and through the impervious layer, thus restricting the swamp's capacity

to summer level. Some swamps were never permanent, while others held a perennial supply, and for that reason attracted the first settler, just as they did the blacks. Thus Balla Balla, Tyabb waterholes, and Bungunyan were selected, and the homesteads built on the native camp sites. Now only one of the Tyabb waterholes holds water, and the Bungunyan is more often dry than not. Bungunyan, before the advent of the rabbit, was a permanent sheet of water. Blacks' Camp (so-called) at the corner of the Cape Schanck and Flinders Road, is now simply a small waterhole, yet an old resident (Mrs. Cairns) can remember the blacks throwing their piccanninies into an extensive swamp to teach them to swim. Another resident states that once only has he known this swamp to be dry; and his memory extends back for more than 65 or 70 years.

Although it would seem that permanent water was an essential, the Bass Strait shore between Rowley's Rocks and the back beach, Rye, which contains by far the most complete record of the aborigines on the Mornington Peninsula, has no swamps or creeks within some miles of it. This appears to be a contradiction to the necessity of permanent water to native habitation. From the presence of *Haliotis*, limpet, and periwinkle shells round the edges of the Tootgarook Swamp, Sailor's (De Sele's) Lagoon, and other permanent waters in the district, it appears certain that they often carried their shellfish to the permanent water, possibly, in this instance, to a greater extent.

It is a curious fact, that the foreshore of that part of Western Port Bay, where the mangrove grows, contains but few traces of native habitation; all the camps were inshore. On the other hand, the open shores of the southern part of Western Port Bay and Bass Strait were much favoured.

In the small lagoon, near Langwarrin railway station, a hafted axe was found in the peat. It was my misfortune to arrive in the district after the find, but I was informed that the handle, black as the peat, and obviously very old, was bent round the stone axe, which was apparently not grooved, bound with fibre, and cemented with grass-tree gum.

At Barrett's Swamp, a mile south, knives, flakes, chips, nuclei, rasps, pounding stones, and a crude axe or two were collected. At the Blacks' Camp (always referred

to as such by the residents), Somerville, I obtained flakes (some showing secondary chipping), and fragments of axes, but never a complete axe. Both before and since my survey, numerous axes have been ploughed up, and there was recently a news item in the local paper regarding such a find.

On the shores of Rutherford's Inlet, there are heaps of oyster shells, which are ascribed to the aborigines, but the Inlet was beyond my survey, and I had little time to devote to it. On Brilla a few flakes were obtained, showing that the natives visited the island. At Balla Balla there is evidence of a large kitchen midden on a ploughed field. I heard from various sources that numbers of axes had been ploughed up from time to time in the neighbourhood. This area would repay close scrutiny, and I am convinced that some valuable finds would be made.

Tyabb Waterholes (formerly "The Willows," the homestead of J. Watson) was the site of a large kitchen midden. It is situated in a depression on white freshwater sand, which has been ploughed continuously for 70 or 80 years, consequently the native implements are much scattered, and have to be searched for. Nevertheless, I obtained there, knives, flakes, broken edges of ground axes, pounding stones, etc., etc. It is probable that a great quantity of material awaits a collector who could be on the spot when the ploughing is done.

About a mile further south is the Shooter's Camp, or sometimes called the Shooter's Lagoon, the permanent camp of professional game hunters, who supplied the Melbourne market in the early days. This was a native camp, at which numerous small implements were found.

At the Bungunyan (King's Station), I obtained axes, flakes, knives, sharpening stones, pounding stones, etc., etc. Here, again, the midden has been ploughed.

Curnweel, Babbaleip, and Coolamadoolam were not surveyed geologically, but I traversed most of them and found little of interest. A survey of Bandienanmer, Parrewurruckwurruck, Mooradoo, Merram Merram, and Coolart, proved of little interest from an ethnological point of view. This was disappointing, as I expected to find traces of aboriginal habitation along the Warren-guite.

At Tulam, on the southern side of the point, there is

a small creek (called Midden Creek on my geological map) that heads back towards the Coolart (Mcerrick's Creek). Here I found abundant evidence of a large kitchen midden, in the form of shells, bones, ashes, cooking stones, flakes, a pounding stone, and an axe made of metamorphic rock. Mr. Hagger, of Tulam, is reported to have found a boomerang in the dune sand. This midden is like those on the shore of Bass Strait, i.e., on dune sand and limestone; where the white freshwater sand and the dune sand and limestone exist in close proximity, the blacks, for some reason, appear to have selected the latter. (cf. Blacks' Camp, near Cape Schanck). As Midden Creek seldom flows, they must have watered above tide level in the Coolart. The sea is encroaching so fast that this midden must shortly be engulfed.

The basaltic red clay area comprises the whole of that south of a line from Arthur's Seat to Coolart and east of the Wallermeryong. We know that the blacks roamed over it (H. Tuck), but excepting on one watershed, only a few scattered flakes were found. The watershed referred to is that between Double Creek and the Yallerong, on which numerous traces of habitation were found, particularly near the Punch Bowl. I found, along this ridge, portions of axes, pounding stones, knives, flakes (some showing secondary chipping), chips, etc. All the fragmentary axes were of basalt and patinated; they were seemingly very old. On the fringe of the basaltic clays there are some poor examples of middens on the raised beaches opposite the Merremdielwokewoke (Tucks), and on West Head they were not large camps like those on the Tyabb and Tootgarook Sands.

Up Stockyard Creek (Targoot in part), and the Wallermeryong (Main Creek) traces of the blacks were rare. We pass out of the Wallermeryong on to the Tootgarook area, composed of dune sands and limestones, and topographically dissimilar to any other portion of the Mornington Peninsula.

The relative absence of traces of aboriginal habitation on the ridge west of the Wallermeryong, has already been referred to. In passing, it should be noticed that the sand on the ridge is similar to that of the Tyabb area, and not typical of the Tootgarook area. This white sand extends south to Blacks' Camp, but the camp itself is on dune sand. Blacks' Camp, near the head of the Burra

Bong, is one of the best examples of a kitchen midden on the Peninsula. Besides, remains of shellfish of many kinds, bones, knives, flakes, crude axes, etc., may be collected, the smaller implements in quantity. Early recollections of it as a blacks' camp have already been referred to. One old resident (not one of the first) raised the question as to whether it got its name from the blacks, or because Black, the surveyor, camped there while he was conducting the trigonometrical survey. I have not ascertained whether Black conducted this part of the trigonometrical survey, nor whether a trigonometrical party ever camped at the lagoon, but the trigonometrical station is some miles to the south, and as it was only a minor triangulation, a fixed camp would be scarcely necessary.

On the small promontory that juts out from Cape Schanck, below the lighthouse, there is a kitchen midden that has been much reduced by erosion and human agency. I found in the vicinity a few chips and flakes, but nothing of compelling interest.

By far the most interesting area on the Peninsula, from an ethnological standpoint, is the Bass Strait shore, from Rowley's Rocks to the back beach at Rye (the limits of the survey). It is a matter of extreme interest to note that the shifting sands forming the margin of the Strait have accumulated since the place was first settled. I have been repeatedly informed (C. Cairns) that, in the first place, the consolidated dunes (i.e., grass country) extended to the ocean foreshore, and where the *Metaleuca*, and other scrub were absent the area was covered with a thick cover of native grasses, abounding in kangaroos and native fauna of all kinds. The dune sand has encroached in some places up to 40 chains. The old resident's statement is corroborated by the fact that at places banksias still stand up and protrude above the shifting dunes, having been covered where they grew.

As the sand is always shifting, the underlying surface of consolidated dune is from time to time exposed, and here we find all kinds of implements—axes, usually crude or blank, but occasionally polished, mills, pounding stones, knives, chips, flakes, cooking stones, charcoal, fragmentary bones, etc., etc. In one place I found the cooking stones left just as the aborigines had used them; in another, evidence of a kitchen midden at low-water mark, showing the amount of erosion that had occurred

since. About a mile inland from Boag's rocks, and well beyond the reach of the moving sand, is a large kitchen midden about four chains long, and half a chain wide. This represents the class of middens that has been covered by the encroaching sand. In it I found an axe or two, numerous flakes, bones, odd cooking stones, ashes, and a varied assortment of shells. As this midden has lately been ploughed, and must now begin to disintegrate, it should be properly overhauled.

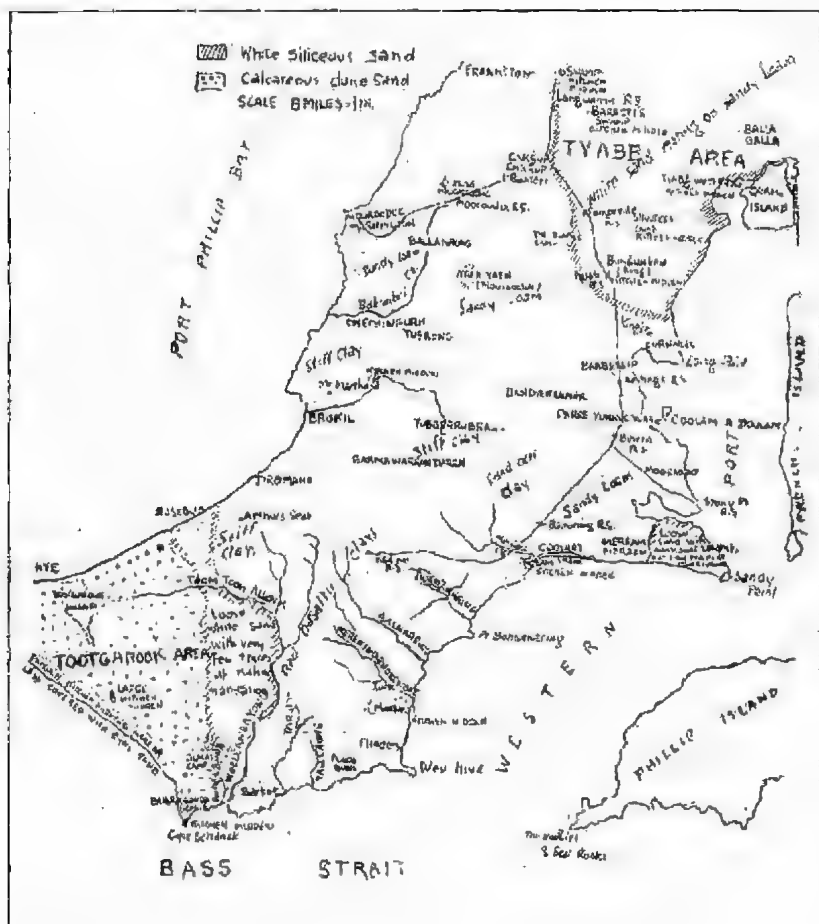
The platform above Boag's Rocks has never been covered with sand. There is every evidence of a kitchen midden on a large scale; but the tally of implements was very meagre. The Bass Strait shore line will well repay repeated searchings, for newly-exposed kitchen middens and camps, and will prove a veritable treasure trove to the ethnologist.

In a road cutting on the Boniyong (anglicised to Boneo), pre-emptive right, near the State School, I found, from 21 to 31 inches below the surface of a grass-consolidated dune, and resting on what was undoubtedly the residual soil of the underlying limestone, flakes and chips intermixed with *Mytilus* shells, fragments of axes, bones, etc., etc. The implied midden is something newer than the underlying dune limestone, and probably newer than the Tootgarook Swamp, which was the reason for its being in its present position, but it belongs to one of the earlier series of barclains that formed on the east side of the Mornington Peninsula, and gradually moved westwards until they closed the opening of Port Phillip Bay. Whether it will be possible to compute the age of the dunes, and estimate the period of time involved in their migration to the westwards, is a problem that awaits investigation, but, notwithstanding the fact that the implements were found beneath dune sand, which, of course, is irregular in its rate of accumulation, I regard the flakes and chips as evidencing considerable antiquity.

There are numerous traces of native occupation around the Tootgarook Swamp, in the shape of flakes and chips, and remains of shellfish. Some of the shells have been carried from Bass Strait; of such there is certain proof in the rock attached forms, such as the limpets, etc. There is, however, practically conclusive evidence that the Swamp was formerly tidal, and some of the oysters, for instance, may have come from it.

On the Toom Toom Allock I found few traces of imple-

ments, and practically none along the Port Phillip shore. A diabase axe was found about 400 feet up the side of Arthur's Seat, and another about the 150 ft. contour on the south side of Mt. Martha. On the Mt. Martha Pre-



emptive Right there is an inlier of freshwater sand overlooking a deep cut-back of what is really the channel of the Tubbarubbabal. This sand covers a low hill, on which chips, flakes, knives, pounding stones, and a small axe were found. There are traces of ashes, shells, and bones, suggesting that this was a true kitchen midden.

At the Yaen Yaen, about three miles south of Moorooduc railway station, a few knives and flakes were obtained; but although the Swamp was originally permanent, and similar to those at the Blacks' Camp at Somerville, Barrett's Swamp, and the Bungunyan, it did not yield much by direct search. I have been informed, however, that numerous axes have been ploughed up.

My survey did not reach the Manmangur, Gunyong, Kakeraboite, and creeks flowing north-westerly into Port Phillip Bay from Mt. Eliza. On the shore north of Mornington, there are kitchen middens on the raised beaches that have been much despoiled by indiscriminate collectors. They may, however, have some treasures still to yield up, and should be systematically searched and mapped.

The aborigines disappeared from the Mornington Peninsula in 1857 (Tuck). The influx of white settlers began about 1840, so that only those who are, say, over seventy-five, could have a reliable recollection of the blacks. While I was conducting the geological survey, I came in contact with several old residents, of ages ranging from 75 to 85 years, and from them obtained some interesting information. But how much has been missed by not taking an active interest in what they had to tell, and the opportunity has all but vanished, for even in the brief period that has elapsed since my survey, some of them have passed on. I availed myself of every opportunity to authenticate old names, and ascertain hitherto unrecorded ones for my geological maps. Moreover, I took every opportunity of checking the narratives, and where they related to the same subject, was amazed at their substantial accuracy.

The late Mrs. Balcombe Murphy, of The Briars, Mornington, had a reliable memory, and cherished her early recollections of the Peninsula. She supplied me with the native name of Dunn's Creek, viz., Bakmanwarrandarra, the correct form of the anglicised Tubba Rubba, viz., Tubbarubbahal, and confirmed such native names as Chechingurk, Tuerong, Moorooduc, and Robbanaring. She had an unique collection of the handiwork of the local tribe. If Mrs. Balcombe Murphy has kept a diary, or made notes, they will be found to contain, in all probability, items of intense interest relating to the Mornington Peninsula.

Another name new to maps, Yaen Yaen, was first

given to me by Mr. Murray; it is, however, often used by old residents for the swamp at the old settlement of Moorooduc, about three miles south of Moorooduc railway station. The spelling of it adopted here is taken to be somewhat equivalent to Yan Yan Gurt, further north, but to get the correct sound a diphthong is necessary.

Balnarring was formerly applied to the Stony Creek valley. Meremendiewokewoke, or Mendiemendiewokewoke (H. Tuck) was in the Manton's Creek valley. The blacks that roamed over the region were known as the Tal Tal tribe (S. Tuck). Bandananmer was at the headwaters of the Warranguite Creek. I heard Sandstone Island, off Hastings, referred to as Coolam, the Departmental plans have it as Koolamandoo, but in native parlance it was Coolam a doolam. Parre Yurruc Yurruc, on an old geological map, is the name of the mainland opposite Coolam a doolam, but I could find no corroboration of it. Babbaleip was the King's Creek valley (Noble), and Curnweel, Long Point. Bungunyan, or Bangian of the old plans, is authenticated in a number of ways, and similarly Tyabb Waterholes, and Balla Balla. Sage's Creek was known as Biningnaring. Moorooduc is applied to the Mt. Eliza pre-emptive right on the Lands Department plans, but to Schnapper Point on the oldest geological map (1856). For many years it has been applied to the settlement at the Yaen Yaen, and still later to the railway station, three miles north. One looks with suspicion on the wide use of a name, and also on such a name as Morradoo, at Crib Point, which is apparently the same.

I could obtain no confirmation of Ballarong. Brokil is an old plan name for the outlet of the Tubba Rubba Creek. Boniyong has been anglicised to Boneo, and Toom Toom Allock somehow changed into Drumna Mullock. Tootgarook was retained by J. Purves as the name of their pre-emptive right, and was taken from the swamp. I could obtain no authentication of Merram Merram, but Coolart is amply authenticated.

There is a number of place names near Frankston that are obviously native names, and there may be someone living whose memory is still reliable enough to authenticate them; but the time has almost slipped by, and I am afraid that they will go down to future generations merely as curious examples of the native language.

THE LILIES OF VICTORIA.

Part VI.

BY H. B. WILLIAMSON, F.J.S.

Although, with Part V. of this series of articles, the description of our true Lilies (Fam. *Liliaceae*) was concluded, I have ventured to carry on with the few representatives of the allied families without altering the title of the series.

FAMILY XYRIDACEAE. (One Genus, *Xyris*).

The plants of this family are very closely allied to those of *Liliaceae*, differing in having only the three inner segments of the perianth petal-like, the outer ones being scale-like, and in having only 3 perfect stamens.

XYRIS OPERCULATA, Labill. Tall Yellow-eye. Fig. 1.

Perennial, with tufts of linear leaves 6 to 9 inches long, with distichous brown shining leaf bases. Scapes slender, 1 to 1½ feet high, bearing ovoid or globular flower heads, sometimes ½ inch across, enclosed by broad, black scales. Perianth with a short tube with three outer segments (sepals). Two of these, sometimes spoken of as bracteoles, enclose the flower in bud, and are brown, scale-like and boat-shaped, with a sharp keel (1b), usually ciliate or fringed; while the third one is thin, and encloses the petals and stamens as in a bag which becomes detached at the base, and cast off as the petals expand. Petals often over ½ inch across, broadly ovate, yellow, soon withering. Perfect stamens 3, sterile stamens (*staminodia*) slender, with a tuft of hairs. Recorded from the S.W., S. and E. of Victoria, and from all States but W.A.

XYRIS GRACILIS, R.Br. Slender Yellow-eye.

Very similar to narrow-headed forms of *X. operculata*. Fig. 1, and not easily separated from that species. It has leaves usually shorter, flatter, and more twisted. The flower stalks and heads are more slender, the lateral sepals are not keeled, but rounded and smooth (1c), and the petals are somewhat smaller. An essential difference occurs in the placentas, which in this plant do not extend to the apex of the ovary. In Rodway's *Tasmanian Flora*, an additional distinguishing mark between the two species is given—"Flowers, pale yellow—*X. operculata*. Flowers orange—*X. gracilis*." The distribution is the same as that of *X. operculata*.

Family AMARYLLIDACEAE.

The plants of this family are more nearly related to the orchids, having the ovary inferior, with the stamens attached above it; nevertheless, some of them are popularly called "Lilies," e.g., Belladonna Lily, *Amaryllis*; Guernsey Lily, *Pancratium*; Alstromer's Lily, *Alstroemeria*; Lent Lily, *Narcissus*; Murray Lily and the Darling Lily, *Crinum*; and Garland Lily, *Calostemma*. Others of the family are: Narcissus, Daffodil, Jonquil, all *Narcissus*; Snowflake, *Leucojum*; Snowdrop, *Galanthus*; American Aloe, *Agave*. The true Aloe is a Lily. The family is represented in Australia by nearly a hundred species (13 genera), six of these (3 genera) being recorded from Victoria.

KEY TO THE GENERA.

1. Flowers, solitary, without a tube *Hypoxis*
Flowers, tubular, in a terminal umbel 2
2. Flowers, large, without corona *Crinum*
Flowers, small, filaments united into a corona *Calostemma*

Genus HYPOXIS.

HYPOXIS HYGROMETRICA, R.Br. Golden Weather-glass.
Fig. 2.

Plant with a rhizome thickened into a small tuber emitting thick, clustered roots, and covered at top by the membranous leaf-sheaths, not splitting into fibres. Leaves narrow-linear, sometimes over 6 inches long, usually sprinkled or ciliate, with long hairs. Scape shorter than the leaves, bearing 2, rarely more; orange-yellow star-like flowers. Segments 6, about 4 lines long. 3 outer ones often darker coloured outside. Anthers (a) deeply divided at the base. Stigmas erect and connate (b). Blooms from November to February. Recorded from all districts, but not frequent, and in all other States but W.A.

HYPOXIS GLABELLA, R.Br. Yellow Star. Fig. 3.

This differs from the foregoing in its scarcely lobed anthers (a), its bright yellow flowers, and the total absence of hairs. Its rhizome is bulb-like, and is covered with the fibrous remains of the old leaf-sheaths. Flowers solitary, perianth segments 3 to 5 lines long; stamens nearly equal in length; scape with a long, sheathing bract about the middle. A much more common plant than the last species, blooming in early Spring, and growing often so thickly as to give the grass land a bright yellow appearance. (b) shows ovary stigmas and two of the stamens. All districts of Victoria, and in all other States.



1, *Xyris*. 2, 3, 4, *Hypoxis*. 5, *Calostemma*. 6, *Crinum*.

HYPOXIS PUSILLA. Hook f. Tiny Star. Fig. 4.

Distinguished from the foregoing by its perianth segments, scarcely 2 lines long, and by having three of the stamens usually shorter than the others; scapes rarely over an inch long, usually with two small, bristle-like bracts above the middle. Recorded from the S.W. and S. of the State, and from N.S.W. (var. of *H. glabella*), and probably found in other States.

Genus CALOSTEMMA.

Greek: *Kalos*, beautiful; *stemma*, crown.

CALOSTEMMA PURPUREUM, R.Br. Garland Lily.

Plant with a bulb attaining a diameter of 1½ to 2 inches. Leaves linear, usually developed after flowering has commenced; scape 1 to 2 feet, bearing an umbel of many flowers, purple in the type form, but pink or white in the variety *carnea* (*C. carneum*, Lindl.), bracts 2 or 3, large, pointed; pedicels to nearly an inch in length, segments about ½ inch, spathulate; stamens 6, inserted at the summit of the tube, united by membranous wings to form a toothed corona about half the length of the segments; fruit globular, one-seeded. Rare in the N.W., Lake Hattah, J. E. Dixon.

Genus CRINUM.

Greek: *Krion*, Lily.

CRINUM PEDUNCULATUM, R.Br. Murray Lily.

A tall bulbous plant, with broad leaves sometimes 3 inches across, smooth at the margin; scape (peduncle) 1½ to 3 feet high, robust; flowers 5 to 15, sometimes over 20; pedicels nearly an inch long, with large broad bracts. Perianth large, white and fragrant, with segments 2 to 2½ inches long, at the summit of a slender tube about 2 inches long. Stamens 6, fixed at the base of the lobes. Styles long and thin; capsule ovoid, very shortly beaked.

CRINUM FLACCIDUM, Herb. Darling Lily.

A less robust plant than the above, with fewer (6 to 8), but larger flowers. It has a longer tube (Fig. 6, a single flower), and shorter and narrower leaves scabrous at the margin. Both these species grow along the Murray and other rivers in the Riverina, but there is no authentic record of them from this side of the Murray, so that they cannot strictly be included in our census. I have a specimen of *C. pedunculatum* (per E. E. Pescott), which was growing in a garden at Mildura, the bulbs having been brought from Riverina. Both species, as well as eight others, are recorded in Bailey's "Queensland Flora." The former also grows in South Australia.

OCCURRENCE OF THE TUPONG (*PSEUDAPHRITIS URVILLII*) IN SALT WATER.

BY J. A. KERSHAW, C.M.Z.S.

Further evidence of the occurrence of the "Tupong," or "Fresh-water Flathead," in the sea, has been furnished by Mr. Donald Macdonald in his "Notes for Boys" (*Argus*, September 18th, 1928). He states that this species is often caught off the coast, by Gippsland fishermen, and that a resident of Prospect mentioned their coming in from the sea. This confirms some earlier observations regarding which there was, at the time, some considerable doubt.

In 1872, the late Count de Castelnau, at that time Consul for France in Melbourne, and a well-known ichthyologist, described the Tupong under the name of *Pseudaphritis bassii*, from one specimen, obtained in Bass Strait. It had, however, already been described by Cuvier and Valenciennes, in 1831, as *Aphritis urvillii*. Many years after Castelnau's record, anglers began to take the fish in some of our fresh-water streams, in consequence of which its reported occurrence in Bass Strait was regarded with very grave doubt.

In 1883, a specimen was caught at Port Melbourne, but as this locality is close to the mouth of the Yarra, the appearance of the Tupong in the sea might have been accidental. Another specimen, however, taken in a net off the shore at Mordialloc a few years later, and a further specimen, observed by the late Dr. T. S. Hall and myself in one of the salt-water tanks at the Melbourne Aquarium, furnished convincing evidence of its occurrence in salt water.

Further evidence from off the Gippsland coast is, therefore, important, and while removing any doubts which may still exist, confirms Castelnau's early record. Specimens in the National Museum, from such widely-separated localities as the Murray River, at Mildura, Cape Otway, and Werribee River, Sale, Wilson's Promontory, and the Yarra at Studley Park, Melbourne, show that the Tupong occurs in fresh-water streams practically throughout the State.

Club Badge.—The new Club Badge is now available in three forms:—Brooch, Pendant, or Stud for coat lapel. Price. 2/6 each. Application should be made to the Hon. Treasurer.

NOTABLE NATURALISTS.

GEORGE MASTERS.

George Masters was at one time the best-known naturalist in Australia. Coming from England, as a horticulturist, when under age, he went to Tasmania, where he was much struck by the beauty of one of our jewel-beetles, *Stigmodera erythromelas*, and started to collect systematically. He was, soon afterwards, employed by the late Dr. A. W. Howitt, of Melbourne, in



George Masters.

whose cabinets (now in the National Museum) are many specimens taken by Masters.

Subsequently, Masters joined the Australian Museum, Sydney, as Assistant Curator, and later was induced, by Sir Wm. Macleay, to take charge of his collections, afterwards transferred to the Macleay Museum at the Sydney

University, with Masters as the first Curator. For the Australian Museum he collected all kinds of natural history specimens in many parts of Australia and Tasmania, his most notable collection being at Gayndah, in Queensland, where he was specially sent to obtain specimens of the then newly-discovered Lung-fish, *Neoceratodus forsteri*.

Macleay, in writing of his collection, remarked:—"Mr. Masters has not only been so successful in the object of his mission as to get nineteen of these anomalous animals, but has also brought back with him a very large collection of specimens in all branches of Natural History. Among these the collection of Coleoptera stands pre-eminent, it contains more than 1,100 species, and numbers nearly 16,000 specimens."—(Macleay, *Trans. Ent. Soc. N. S. Wales*, ii., p. 79.)

At one time more than half of the natural history specimens in the Australian Museum were of his taking; and even now, a very large proportion of the specimens there were taken by him. After assuming charge of the Macleay Museum, Masters very considerably improved the collection, many of the old specimens having the crude pins of a century and a half ago, and some of the South African insects having even been transfixed with thorns. He also collected in parts of New Guinea, for Macleay, during the "Chevert" expedition, paying special attention to birds. He obtained the first known egg of the common Bird of Paradise (*P. apoda*), now in the Macleay Museum. He was always much interested in birds, and probably collected a greater variety of them than any other man in Australia. Mammals, reptiles, fishes, shells, and other natural history objects were collected, but his special favourites were the beetles, his private collection of these being added to the Macleay Museum. More Australian species of vertebrates and invertebrates were named after him than any other naturalist of his time.

George Masters was a splendid shot, fearless in the bush with natives (much more numerous then than now), and frequently caught reptiles, including venomous snakes, with his bare hands. He published a catalogue of the Coleoptera of Australia, with two supplements, still very useful to every worker of Australian beetles; and a catalogue of the Coleoptera of New Guinea. He also described a few birds.

Towards the end of his life he suffered considerably

from nervous complaints, and he was once in a cataleptic trance for a few days. His eyesight also became very poor, and this resulted in the cab accident which terminated his life. He was a man of strong likes and dislikes, always willing to oblige a friend, fond of a yarn, and the writer has many pleasant recollections of the old man. He was twice married, his second wife accompanying him on a holiday trip to England, including his native village; but his eyesight was so poor that the trip did not bring him much enjoyment. He left no children, but his wife survived him.—A.M.L.

"HARMONY"—ASSOCIATION OF MICROSCOPIC ORGANISMS.

In his interesting article, "Ant-house Plants and Their Tenants," in the September issue of the *Naturalist*, Mr. C. Barrett, in a sense, throws out a challenge which he says (p. 134—"... whereas a rather simple explanation—Symbiosis may be offered for acceptance or not, as you please." There is an expression, knowable in a wider sense—more acceptable because of that, and in itself equally acceptable—for this association of organisms, viz., "Harmony."

To study these things in their simplicity, in their essentials, no better field exists than among the Protozoa and other microscopic organisms. Here, if studied sufficiently, may be seen all those characters of behaviour which bewilder and tantalise us in the higher organisms. Here they are all reduced to terms of transient form and relative motion—to the motion of nature.

A parallel case to that of *Myrmecodia* and ants is the association of a colonial form of the class Rhizopoda with the desmid *Staurostrum sexangulare*. I am not aware whether this association has been previously noted, being unable to find any reference to it in the few papers and books at my disposal. In this district (Nanneella Estate, near Rochester) it is quite frequent—the rule rather than the exception, apparently, though the activities and real nature of the attached organism long escaped my notice.

Numbers of the organism up to perhaps 50, are grouped round the waist of the desmid, which here, and with its many projecting arms, affords much shelter, if these creatures are capable of appreciating such—a possibility that no one can assert with certainty, nor yet deny. In the case of another desmid—a *Docidium*, with several lines of conspicuously projecting "teeth" along its length—it may often be had with dense colonies of the flagellate *Bicosoeca* attached; not, however, on the teeth, but within their shelter. *Bicosoeca* is a very sensitive creature, and will suddenly retract within its test or "house," in uncongenial conditions. Here one might well suspect that an appreciation of the value of shelter exists, yet this same flagellate, or one not distinguishable from it, may be found in other and exposed conditions.

Our Rhizopod seems to be colonial in a wide sense, in that, so far as I can discover, it belongs to the group, which produce reticulated pseudopods organisms allied to *Liberiellum* and the Foraminifera, the pseudopods constituting an ever changing network, in the present case probably linking thus, the individual organisms into a unity, a sort of commonwealth. Of such minute

creatures it is difficult to speak with certainty. Usually, between the arms of the desmid is a scattered mass of what appear to be bacterial remains, held in this net-work of pseudopods. Arising from the arms of the desmid, apparently from the axil, so to speak, of the minute spines seen in regular series along those arms, are minute cylindrical forms, slightly swollen at the distal extremity. These may be a product of the desmid, or may be independent epiphytic forms. The pseudopods of the colonial Rhizopod project well beyond the arms of the desmid. Maybe they afford some protection to the desmid, for these organs often prove—in other forms—dangerous, and even deadly, to unwary creatures.

This, however, is speculation as is a further suggestion—yet still worthy of consideration—that the desmid benefits by the digestive and metabolic activities of the Rhizopod and the local change thus induced in the environment; or the benefit thus may be mutual.

Some details of these plant-animal associations may be noted, but probably can never be known in completeness. The desmid can live and flourish without the Rhizopod. Possibly the same is true of the Rhizopod, though I have never detected it elsewhere. We can know life only as activity and such associations—at least not injurious—suggest the word *Harmony*, having as its basis one of our fundamental conceptions of Nature, viz., Motion. The expression, "Symbiotism," is a cul-de-sac, and hence a barren term, while the word "*Harmony*," which we can visualise in two tuning forks, vibrating in unison, can carry our minds to wider fields, and enable us to see and think of other parallels. That, surely, should be the aim, or one of the aims, of Nature study.

On page 137 of the September *Naturalist*, another of these abstract problems is raised. Here that enigma, "*Mind*," is again in question. Again among the Protozoa, where organisation seems reduced to a simplicity not elsewhere to be found, may we discover, if ever, an answer. The word "*shy*" has been used to describe the activities even of the Rhizopods. Many of these organisms are suddenly retractile, and after an interval, short or long, slowly expansile, just as a weevil, on being touched, will retract its antennae and legs, and, after a while, slowly resume its normal activities.

There is a small Helizoon, *Astrodisculus*, which, when one pseudopod is unduly interfered with, as by a large organism, will instantly retract all pseudopods; and, after remaining quiescent for a time slowly—we might say, cautiously—again extend them. No eye or "peep-hole" here, it is true; yet not far removed from them in the scale of organisation, some rudiment of the former is present. In the weevil, just as in these lowly organisms, we are dependent on appearance only to obtain an answer to the question raised—J. A. Ross.

The Ethnological section of the Club held its monthly meeting on September 18th, at Latham House, Mr. A. S. Kenyon being in the chair. Mr. Chas. Daley read a paper on "*The development of an artistic sense in the aborigines of Australia*." This was followed by a general discussion. Mr. J. A. Kershaw exhibited some interesting objects illustrating the subject. Mr. Kenyon exhibited literature containing reproductions of primitive arts and crafts among the aborigines, including "*Art in Australia*" for March, 1925, which contains designs in colour from aboriginal work, and suggestions as to application of similar designs in domestic decoration.

ANTS FROM NORTH QUEENSLAND.

BY J. CLARK, F.L.S., Entomologist, National Museum,
Melbourne.

The collection of ants made by Mr. C. Barrett, C.M.Z.S., in North Queensland, contains fourteen species, one of which is new and is described below. A fine series from the collection, including the type of the new species, has been donated to the National Museum, and forms a welcome addition.

Sub-family PONERINAE.

RHYTIDOPONERA CONVEXA, Mayr, Jour. Mus. Godeffroy, 12, p. 92, 1876.

Two examples of this species were found at Cairns.
LEPTOGENYS (LOBOPELTA) DIMINUTA, Sm. var. *YARRABAHNA*, Forel, Arkiv. f. Zool. 9, 16, p. 29, 1995.

A small colony was found nesting in an epiphyte (fern) near the Daintree River.
ODONTOMACHUS TURNERI, Forel, Ann. Soc. Ent. Belg. 44, p. 56, 1900.

Several examples from near Cairns.
ODONTOMACHUS AJAX, Forel, Rev. Suisse Zool. 18, p. 10, 1910.

Several examples were found at Port Douglas.

Sub-family MYRMICINAE.

PHEIDOLE MEGACEPHALA, Fab., Syst. Ent. 2, p. 361, 1793.

Two colonies were found in pseudobulbs of *Myrmecodia beccarii*, growing on the Mangroves near Cairns. They had probably destroyed the original inhabitants. This is an introduced pest, which is now widely distributed in Australia. This ant has caused great havoc in various parts of the world.

Sub-family DOLICHODERINAE.

IRIDOMYRMEX CORDATUS, Smith, Jour. Linn. Soc. Zool. 3, p. 137, 1859.

Several examples were taken from *Myrmecodia beccarii*, near Cairns. The specimens examined are not quite typical, but appear to be nearer to *cordatus* than to the variety *stewarti*, Forel. This ant was figured by

Mr. Barrett in the last issue of the *Vic. Naturalist*, as *I. myrmecodia*, var. *stewarti*, Forel.

Sub-family FORMICINAE.

OPISTHOPSIS RESPECIENS, Smith, Jour. Linn. Soc. Zool. 8, p. 68, 1864.

A single example taken at Cairns.

OPISTHOPSIS HADDONI, Emery, Rev. Suisse Zool. 1, p. 226, 1893.

Several examples from Kuranda.

CALOMYRMEX ALBOPILOSA, Mayr, Jour. Mus. Godeffroy, 12, p. 61, 1876.

Several examples from Port Douglas and the Daintree River.

CAMPONOTUS (TANAEMYRMEX) DORYCUS, Sm. s. sp.

CONFUSA, Emery, Ann. Mus. Nat. Genova, 24, p. 215, 1887.

Several minor workers and soldiers were taken at Port Douglas.

PARATRECHINA (NYLANDERIA) OBSCURA, Mayr, Verh. Zool.-bot. Ges. Wien, 12, p. 698, 1862.

Five specimens from Cairns.

POLYRHACHIS (CHARIOMYRMA) AUREA, Mayr, Jour. Mus. Godeffroy, 12, p. 73, 1876.

Many examples from Cairns and Port Douglas.

POLYRHACHIS (HEDOMYRMA) DAMELI, Mayr, var. ARGENTOSA, Forel, Rev. Suisse Zool. 10, p. 515, 1902.

Six examples from Cairns appear to belong to this variety, but are larger than those described by Forel; they agree otherwise with the description.

POLYRHACHIS (HEDOMYRMA) BARRETTI, n.sp.

(Fig. 1.)

Worker.—Length, 6.5-7mm.

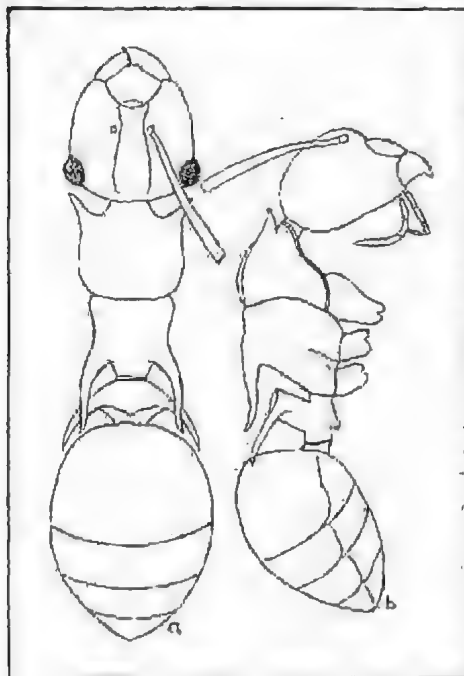
Black; antennae and tarsi brownish black.

Hairs yellowish, sparse, short and scattered, a little longer on the clypeus and gaster than elsewhere. Pubescence on the antennae and legs very fine and adpressed; none on the head, thorax and node. The gaster is clothed with a fine short yellowish pubescence, which does not quite hide the sculpture.

Shining: The thorax highly polished, mandibles very finely and densely striate-punctate. Head longitudinally and finely striate. Pronotum strongly and regularly striate longitudinally. The mesonotum and epinotum longitudinally striate, much finer than on the pronotum, the striate descending into the epinotal declivity. Spines of the epinotum finely punctate. Node smooth. Gaster finely and densely reticulate-punctate.

Head longer than broad, much broader behind than in front, the occipital border and the sides convex. The large, globular eyes are placed almost at the occipital angles. Mandibles broad, armed with five large, sharp teeth. Clypeus subcarinate, produced and bilobed in front, there is a short blunt tooth in the

centre of the concavity; this appears as the termination of the feeble carina. The clypeus is microscopically reticulate, and has, near the base of each frontal carina, a small piligerous puncture. Frontal carinae almost parallel, swerving slightly behind, extending to the occipital border. Antennae long and slender, scapes



Polyrhachis (Hedomyrma) barretti,
n.sp.

extending beyond the occipital border by fully one half their length; first joint of the funiculus twice as long as the second, the third slightly longer than the second, the others subequal to the apical. Thorax fully one and a half times longer than broad through the pronotum. The pronotum is one-fifth broader than long, strongly margined on the sides, armed with two broad sharp spines in front; they are twice as long as broad at their base, concave above, convex below; the points directed slightly outward and downward; the anterior border is not margined. There is a strong constriction between the pronotum and the mesonotum; the latter about twice as broad as long, strongly margined on the sides. On the dorsal surface there are no traces of a suture between the mesonotum and the epinotum, but in profile there is a faint indication of such at the base of the epinotal spines. Epinotum very short, rounded into the declivity, the latter longer than the dorsal surface and mesonotum combined; armed with two long spines; they are longer than the epinotum and mesonotum together, they are abruptly bent outward at the base, then continued almost parallel to their points, which are sharply pointed; in profile the spines are almost horizontal, slightly upturned at the points. Node twice as broad as long, the anterior border straight, or feebly convex, the posterior border convex, strongly produced in the centre as a blunt stumpy tooth, the sides each armed with a long slender spine similar to those of the epinotum, they are more wide spread and enclose the gaster at the points; in profile the node is two and a half times higher than long, the anterior and posterior faces parallel, the superior face convex; there is a broad tooth on the ventral surface in front under the anterior face. Gaster oval, longer than broad. Legs long and slender.

HAB.—N. Queensland, Daintree River (C. Barrett).

This species comes near *dameli*, Mayr, but can be readily distinguished by its deep black and shining head, thorax and node, and by the much longer spines.

A FRIENDLY TIGER SNAKE.

BY MRS. E. H. LINTON (South Springfield, Tas.)

In the spring of 1927 I made an addition to my circle of friends of the Wild by coming into somewhat intimate relations with a female Tiger Snake—no less. I first came upon her in my garden, with a family of fifteen active, slender little creatures. The most of the young snakes speedily disappeared, three only remaining, to be seen in various parts of the garden, until they set off on their annual tour.

The mother was fed with milk from time to time, and must have been getting on in years, as she soon settled down in comfortable quarters near my water-garden, and "laid up" for the winter in a disused Platypus run. Her tour, later in the year, was of short duration, and, presumably, to no great distance. She set off, very splendid as to polish and distinct bandings, and was back in a fortnight, rather the worse for wear! Finding no milk in her dish, she came into the house to look for me, appearing from behind the piano as I sat sewing nearby. For some little time she seemed to be taking stock of my new shoes, but, I felt sure, was quite aware that it was I who sat looking at her. Then, after an inquisitive inspection of the entire wainscoting, she followed me out for her milk.

The becoming acquainted with my new friend's habits was most interesting. Dining is a leisurely matter of a week, or longer, with her, and not until she is full-fed does she settle down to the digesting process. While this is going on, she is quiescent, and also very timid and apprehensive, starting at a bird or a fly, and not troubling herself to catch anything whatever. I have seen a Spinebill hovering against the Montbretia blossoms just above her head, and, except for a nervous movement away, she took no heed of it. However, in the "dining" period she killed and ate an unlucky Phascologale, which came to share the milk, three birds, two lizards (one the large brown *Lygosoma*), innumerable moths and flies, two mice, a tree-frog, and two burrowing ones. Milk she will take every morning, excepting during the time of digestion.

She seems to realise that people other than myself might be dangerous to her, and her expanded neck betrays an alert defiance. I noticed that her head is comparatively much smaller than that of a male Tiger Snake, which happened one day to look in on us on his way to the water; otherwise, she is larger, bulkier, and bigger in every way, but with a shorter, more abruptly tapering tail.

REPORT
of the
Victorian Field Naturalists'
Expedition
through the
Western District of Victoria
in
October, 1927

Supplement to the Victorian Naturalist.
VOL. XLV No. 6
October, 1928.

FOREWORD.

Through the liberality of an anonymous donor, who through Mr. R. D. Elliott, made available for the use of the Field Naturalists' Club of Victoria the sum of £200, an excursion was made through the Western District of Victoria in October, 1927. The party consisted of Messrs. E. E. Pescott, F.L.S., President; C. Daley, B.A., F.L.S., H. B. Williamson, F.L.S., C. L. Barrett, C.M.Z.S., Editor, and V. Miller. This was the first of a series of investigations, results of which are herewith given.

Future localities for investigation in 1928, under this benefaction, are the N.W. Mallee, the far N.E. of Victoria, and Mount Wellington and Tali Karng.

Report of the Victorian Field Naturalists' Expedition through the Western District of Victoria

GENERAL.

BY E. E. PEScott, F.L.S.

The purpose of the tour was to visit the Southern and Northern ends of the Grampians, with a detour to Mount Arapiles.

The party left Melbourne on the 7th of October, and passing through Geelong and Colac, reached the vicinity of Camperdown in the evening. Near Winchelsea, some splendid groves of the "Drooping Sheoke," *Casuarina stricta*, Ait., were noted. This useful and beautiful tree is one that should be conserved everywhere; its value as firewood, and as fodder for stock in dry seasons, is causing its gradual diminution among our forest trees, and these areas were thus gladly noted by our party.

Between Colac and Camperdown, the Stony Rises proved interesting country, and would possibly be found to yield both botanical and entomological treasures.

On the second day, Camperdown, Mortlake, Penshurst and Dunkeld were passed through, and a camp was made on the Wannon River, at the foot of Mt. Sturgeon, which mount was botanically examined and climbed on the same day.

The magnificent avenue of Elm trees in the main street is a splendid sight, and well worth noting.

The Public Park at Mortlake proved interesting. Quite a fine collection of trees has been planted, including many Australian native trees. In this park two trees presented a very remarkable appearance. They were the "Coast Acacia," *Acacia Sophoræ*, R.Br., and the "Early Black Wattle," *Acacia decurrens*, Willd.; several specimens of these trees had assumed a decided decumbent habit, the branches growing more or less horizontally, resting on the ground for several yards, instead of growing in an upright habit. In the case of *Acacia Sophoræ*, the old original root system and stem had long since died, and the branches had layered, producing new root

systems, and growing quite vigorously, forming several decumbent trees, spreading for many feet, each with its own root system.

We had at first proposed to spend some days at this camp, but the botanical devastation was appalling. Some years ago, the country near and around Mounts Sturgeon and Abrupt was a glorious garden of native flora. Now, as a result of stock grazing, and the establishment for some years of an Angora goat farm, the country is quite uninteresting from a botanical standpoint.



Star-hair, *Acrotricha ledifolia* (D.C.),
Mt. Sturgeon.

The "Spreading Heath," *Brachyloma depressum*, Benth., and the "Star hair," *Astrotricha ledifolia*, D.C., were both abundant and beautiful on the higher slopes of Mt. Sturgeon.

On the next day, Mount Abrupt was climbed. The flora here is practically the same as at Mount Sturgeon, flowering shrubs and plants only being found on the higher slopes.

In this locality, fourteen species of Orchids were noted, all of which were well known, and none of which were at all abundant.

It was at this camp that the only snakes seen on the tour were noted. Both were the "Tiger" Snake, *Hoplocephalus curtus*, Sch. sp. One was shot near a house. The other was observed on our way towards Mount Sturgeon. It was coiled among some scrub, and quite dormant. A very swollen appearance in the centre of the snake caused some comment; and on dissecting the reptile, the body of a young rabbit was found; from its appearance, it had not been long in the stomach of the snake.

On the 10th of October, we struck camp, and passing through Cavendish, worked easterly into the back portion of the Victoria Range, where camp was again made.



Leaving Camp, at Mt. Sturgeon.

Our objective this time was the settling ponds of the Hamilton Water Works. This portion of the Range is, as yet, quite unspoiled by visitors and tourists. The wild flowers were wonderfully abundant, and great fields of flowers were passed through. Here were acres of the "Mountain Conosperm," *Conospermum Mitchellii*, Meiss., three feet or more in height, and forming a glorious sight. In some places the "Blue Tinsel Lily," *Calcectasia cyanea*, R.Br., was quite plentiful, the rich

blue flowers shining among the shrubs in profusion. This part of the Victoria Range has produced a number of new species, and it is safe to assume that further investigation would probably reveal more varieties.

The "Snow Myrtle," *Lhotskya alpestris* (Lindl.), Black, was present in great shrubby masses, as also was the Lavender Grevillea, *Grevillea lavandulacea*, Sch.

Among the creeks the Coral fern, *Gleichenia circinata*, Sw., and the Forked Sundew, *Drosera binata*, Labill., were growing together in charming profusion. Many specimens of the King fern, *Todea barbara*, Moore, were here noted.

In this locality ten species of orchids were noted, including the Bronzy Caladenia, *C. iridescens*, Rogers.

On October 12th, a move was made to Mount Arapiles, passing through Cavendish, Balmoral and Clear Lake. Calling at a house *en route*, we were charmed with a splendid plant in the garden of Sturt's Desert Pea, *Clianthus Dampieri*, Cunn., of which the owner was justly proud.



Stump-tailed Lizard, *Trachydosaurus rugosus* (Gray),
Mt. Arapiles.

A salt lake at Fulham, and Clear Lake were inspected for aboriginal relics, but both failed to yield any signs of such material.

A day and a half were spent at Arapiles. At this mount, the Stump-tail Lizards, *Trachydosaurus rugosus*, Gray, were very numerous, dozens being seen during our short stay. They were quite easily captured.

The devastation caused by grazing sheep on and around this interesting mountain was quite apparent. Very few small plants were seen, and young seedling plants were conspicuous by their absence. The older plants are dying out everywhere; and it is quite evident that this beautiful and interesting mountain will, in a few years' time, become quite barren, unless some steps are taken to prevent its devastation by grazing.

Some of the native shrubs here show remarkable growth. The "Common Fringe Myrtle," *Calytrix tetragona*, Lab., was abundant, and very robust. One old plant has a stem eight inches in diameter. Another plant was eight feet in height, six feet through, and the stem was six inches in diameter. These plants were evidently very old.

Plants of the "Fairly Waxflower," *Eriostemon obovalis*, Cunn., were also quite vigorous. One was measured nine feet in height, with a stem six inches in diameter.

Plants of "Wallowa," *Acacia calamifolia*, Sweet, were also abundant and robust, some being fifteen feet in height.

The general appearance of the flora of Mount Arapiles is very vigorous, and it is to be hoped that steps will be taken to prevent grazing on the Mount, so that its interesting flora may be preserved for all time.

Only four species of orchids were noted here, and these were growing in rock crevices, where sheep could not reach them. Other measurements taken were of the "Flame Heath," *Astroloma conostephioides*, F.v.M., often four to five feet in height; and the "Common Correa," *C. rubra*, Sm. var. *virens*, eight feet high.

On the 14th October, a detour was made to Mitre Rock, where Mr. Williamson again collected the rare "Skeleton Club Moss," *Psilotum nudum*, L. (Griesch.). Here also, the "White Elderberry," *Sambucus Gaudichaudiana*, D.C., was flowering in beautiful profusion. There were also some fine shrubs of the "Weeping Pittosporum," *P. phillyræoides*, D.C.

We here regretfully noted a very large specimen of the "Wedge-tailed Eagle," *Uroæetus audax*, which had been

shot, fastened in an expanded fashion on to the wire fence, evidently placed as a warning (?) to other eagles which might be in the vicinity.



The Camp at Mt. Arapiles.

Passing through Natimuk and Horsham, camp was made at Mount Zero on the evening of the 14th. We camped near the stone quarries, whence stone is carried for many miles to face the northern irrigation channels.

Here again the flora is both abundant and profuse. The masses of *Lhotzkya*, and *Calytrix* were very beautiful. Mr. Barrett established a new record by finding here a good supply of the Skeleton Clubmoss, which next day was also found by myself on a higher peak.

Some fine plants of the "Bushy Heath Myrtle," *Thryptomene calycina*, J. M. Black, were noted, about eighteen feet in height. We also observed a fine plant of *Conospermum Mitchellii*, Meiss., having six strong stems, eight feet in height. Masses of the "Violet Westringia," *W. glabra*, R.Br., gave a pleasing display of their lovely blue flowers near the quarries. Here also the Horny Cneebush, *Isopogon ceratophyllus*, grew to an unusual height. Six orchids were collected here, one of which, a *Caladenia*, is still under the consideration of Dr. R. S. Rogers.

The following list of orchids observed shows that the Western District is well represented in this attractive Order of Plants:—



Mountain Conosperm, *Conospermum Mitchellii*, (Meiss.),
Mt. Zero.

Mt. Sturgeon.—*Caladenia carnea*, *C. testacea*, *Corysanthes pruinosa*, *Glossodia major*, *Pterostylis nana*, *P. longifolia*.

Mt. Abrupt.—*Caladenia Patersonii*, *C. carnea*, *C. Menziesii*, *Chiloglottis Gunnii*, *Diuris maculata*, *D. longifolia*, *Glossodia major*, *Pterostylis alpina*, *P. nutans*, *P. longifolia*, *Acianthus exsertus*.

Hamilton Water Works.—*Caladenia iridescens*, *C. testacea*, *Prasophyllum fuscum*, *Thelymitra aristata*, *Caladenia carnea*, *C. cucullata*, *C. dilatata*, *C. Patersonii*, *Thelymitra carnea*, *T. longifolia*.

NOTE.—The last six orchids named were also noted on the way from Cavendish to our camp, near above locality.

Mt. Arapiles.—*Calochilus Robertsonii*, *Pterostylis nana*, *Acianthus exsertus*, *Thelymitra* sp. (fruit).

Mt. Zero.—*Thelymitra aristata*, *T. longifolia*, *T. irioides*, *Caladenia iridescens*, *C. dilatata*, and *C. sp.*, not yet determined.

In the absence of an entomologist on the expedition. Mr. Chas. Barrett capably assumed the role. The

accompanying reports on the specimens secured, which have been kindly supplied by Messrs. John Clark, F.E.S., and F. E. Wilson, F.E.S., respectively, show the success achieved.

Among the various insects enumerated and described, it is pleasing to note that in addition to some rare species, some new species were collected.



The Chipping Ground,
Lake Lonsdale.

On October 16th, we passed on to Lake Lonsdale, near Stawell. Here is a noted aboriginal area, and we were able to collect large numbers of chippings, scrapers, "points," pounding and anvil stones, and crude tomahawks. These aboriginal stone implements are to be found all round the shores of the lake, and also on a long sand-bar, which almost divides the lake into two at low water.

The locality has frequently been visited in the past by ethnologists, so that the best of the implements have been collected. Still, we were able to find quite a goodly supply, and had time permitted, we could certainly have collected many more.

Just on the shore of the lake, near the road entrance from Stawell, is a splendid example of "canoe cutting," where the blacks had, in days gone by,

cut a huge sheet of bark to fashion a canoe, from a fine "red-gum" tree. Mr. Barrett photographed this interesting "specimen."

That evening Dobie's Bridge was reached, *via* Stawell and Ararat; and a return was made to Melbourne next day.

The tour was valuable from a naturalist standpoint. Several features are outstanding, the main one being the devastation caused by grazing. The destruction of the flora at Mounts Sturgeon, Abrupt and Arapiles, where sheep are, or have been, freely grazed, is most regrettable. These places will soon be quite barren from a botanical standpoint. There are surely enough grazing areas in our State, without cleaning out the beautiful shrubs and undergrowth from these interesting scenic beauty spots. The Club should make this one of its early future objectives.

Another regrettable feature is the wholesale destruction of Stumpy-tail Lizards. These useful, yet sluggish animals are being killed in all directions. They bask on the sunny roads, and travellers seem to delight in running over the animals, which do not get out of the way quickly. These animals should certainly be protected.

One feature, commonly noted, was the fact that we so rarely knew the name of the town or village through which we were passing. On quite a number of occasions we were compelled to ask for the name. Public offices, such as Police Stations, Post Offices, and State Schools were generally so labelled, but very rarely was the place name given. This is a point on which the Club should take action, for the benefit of all travellers.

Despite the drought season that had just been experienced, many flowers and shrubs were abundantly in bloom: but there was evidence, that in some places, the flora had suffered considerably through lack of sufficient rain.

In connection with the expedition, special mention must be made of the completeness of the arrangements made by Mr. Victor Miller for transport and commissariat, which added much to the pleasure and comfort of all concerned. Mr. Miller's experience in these matters is most valuable in contributing to the successful conduct of such an undertaking.

PHYSIOGRAPHICAL AND GEOLOGICAL FEATURES.

Chas. Daley, B.A., F.L.S.

Leaving Melbourne, the course of the party was immediately over the extensive area of basaltic country, which commencing at Melbourne with the Werribee Plains, is almost continuous for 176 miles westward, covers in Victoria an area of nearly 10,000 square miles, and with slight intermission extends past the Victorian boundary as far as Mounts Gambier and Schanck, in South Australia.

This great lava plain is known as the Newer Basalt as distinguished from the Older Basalts of Miocene periods, and its continuity is almost unbroken except by occasional granitic hills like the You Yangs, a few outcrops of Silurian rocks, and the alluvial deposits of river valleys. On the south these plains touch the base of the Cape Otway Ranges and extend North to the Ballarat plateau and the foot of the Grampians.

Naturally, with the diverse form of the country over which the lava flowed, the depth of deposits varies accordingly. Over this area occurs every evidence of widespread vulcanicity, not only in the numerous craters, terraced laval-flows, ragged basalt ridges, cinder cones, and the derived richness of volcanic soils, but also in the many lake-basins or depressions, some of great extent, caused by the extensive and abundant effusion of lava from vents and fissures, probably succeeded by explosive outbursts and subsequent subsidence as the result of the ejection of vast quantities of molten matter. Much light, both as to causes and operations of these phenomena, has been thrown by the scientific study of existing volcanoes in action, such as Vesuvius and Etna; but more particularly by nearly 20 years of daily observations at the extensive volcanoes of Mauna Loa and Kilauea, in the Sandwich Islands, where scientists, often at the peril of their lives, study closely the constantly-recurring features of effusion, explosion, subsidence, earth movements and eruptions in their relative connection; and obtain knowledge of "oxidations and dissolvings which make brand-new, hot rock look old in a few days, and analyse the geologist's specimen before he has time to collect it."

The interesting area of the Stony Rises with neighbouring craters and lake-basins, was evidently the product of similar powerful agencies violently at work in past ages, of which Tower Hill, and Mounts Gambier and Schanck are probably the most recent examples of activity. As a re-

sult of these widespread, turbulent, and fiery operations, probably in later Tertiary times, we have the rich volcanic soils of the Western District, giving fertility over thousands of square miles, from whose pastures come rich wheat harvests, bountiful dairy produce, and the finest wool in the world.

After passing the Stony Rises, with their confusedly piled heaps and ridges of rugged basaltic rocks, we pitched our tent at Camperdown, in sight of the crater peak of Mt. Leura, from which on the following day we passed onward in view of the old craters of Mounts Elephant, Noorat, Stavely, Rouse, etc., until we reached our destination and the limits of the lava flows at Dunkeld.

There is strong geological evidence here that previous to the formation of this outspread basaltic plain, two or three separate and parallel streams, then flowing Southwards, drained the area between the mountains to the sea. The widely-flowing lava, filling the beds of the streams and raising the surface of the land, diverted the course of their flow Westward along the heaped edge of the basalt, so that the Wannon River, becoming the recipient of the combined waters, was greatly increased in volume, also in length, at the expense of the Easterly streams, which became merged in its course to the West.*

An analogous instance may be observed in the diversion at an earlier period of the course of the Yarra River, when overwhelmed by the lava flows which took permanent form as the basaltic plains of what is now Collingwood, Clifton Hill, Merri Creek, etc., the stream forming a fresh channel, its present one, along the contact fringe of the older basalt with the softer sedimentary rocks of the Silurian measures, as visible from Studley Park round to the Botanical Gardens.

Camp was pitched at the gap between the two precipitous peaks of Mounts Abrupt (2,721 feet) and Sturgeon (1,946 feet), and nearer the foot of the latter. These peaks mark the Southern limit of the imposing Grampians Range, which extends in a boomerang-like curve North and South for about ninety miles.

The range was discovered by the explorer, Major Thomas Mitchell, in 1836, when traversing new territory Westward from Swan Hill. From a camp near the Richardson River, he, with three companions, made a diversion Southward, and ascended the snow-clad summit of Mt. William, 3,829 feet in height, which he named after

*"The Physiography of The Glenelg River," by Chas. Fenner, B.Sc., Proc. Roy. Socy. Vic., Art. 8, Vol. XXX, March, 1918.

King William IV. The party spent an excessively cold night on the peak, returning to camp next day.

The Major named the range the Grampians from a fancied resemblance to the Scottish mountains. Continuing his way around Mounts Zero and Arapiles, he pursued a course Southward, discovering the Glenelg River, which he followed to the sea. On returning from Portland Bay in a North-easterly direction over the Westerly plains, he named the chief features, and, among them, Mounts Abrupt and Sturgeon.



Mt. Abrupt, from the Camp, near Mt. Sturgeon.

Mitchell was a keen observer, taking an interest in the natural features of the country he traversed, and its fauna and flora particularly. To him we are indebted for the first collection of native plants obtained between the Murray and the sea, the plants being sent to Professor Lindley for recognition and description. Seven species in Victoria bear the name of the explorer, of which the Mountain Conosperm, *Conospermum Mitchellii*, the Mitchell Acacia, *Acacia Mitchellii*, the Bushy Heath-Myrtle, *Thryptomene Mitchelliana* (now *calycina*), and the Mitchell Mulga-grass, *Neurachne Mitchelliana*, are the best known.

The Mitchell river in Gippsland also commemorates the explorer of Australia Felix.

This distinctive range of the Grampians flanks the Ordovician rocks and granites of the Pyrenees, and the intrusive granodiorites of Mt. William, and probably in remote ages was superimposed to a very great extent upon their Western slopes. Until recent years, in the complete absence of evidence by organic remains, the place of this formation in the geological record was uncertain.

The discovery of fossil remains by Mr. W. H. Ferguson, of the Geological Survey, solved the problem, the evidence of these remains, as determined by Mr. F. Chapman, A.L.S., revealing that the comparatively homogeneous range of white, red, grey, brown, and purplish sandstones, mudstones, and quartzites, varying in texture, belonged



Typical Rock Formation,
Mt. Sturgeon.

to the Lower Carboniferous measures. The fossils of *Lingula* found at Mt. Rosea, and the fish-scales of *Physonemus* at Hall's Gap in mudstones thus proved of great importance, placing the formation in close affinity with the fossiliferous rocks of the Mansfield district.

The range throughout is characterised by frequent faulting, by its picturesque rock-faces, rising abruptly on the Eastern scarp, by the tabular and jointed structure of the sandstones, and by the angle of dip Westwards, all tending to produce the bold cliffs and headlands which are so marked a feature of the formation, while the effects of

atmospheric agencies, physical and chemical, in wind, rain, snow, and varying temperatures, upon the sandstones, give perfect examples in great diversity of naturally beautiful rock-sculpture, and delicate tracery, as well as forms of the most grotesque appearance.

The Western slopes are often much indurated, almost as if armour-plated to withstand erosive action. In the two peaks at the Southern extremity of the range the boldness and ruggedness are fully exemplified, Mt. Abrupt well justifying its name. The sandstones here vary from white to red in colour, and from fine to coarse in texture.

Leaving Dunkeld, we went Westward over the Northern part of the basaltic plain, a beautiful park-like area with shapely spreading Eucalypts, forming quite a contrast to the almost treeless expanse further to the South, to remedy which Sugar-gums have been so widely planted in clumps for shade and shelter, the species not requiring a great depth of soil for effective growth.



Ponds, Hamilton Water Supply,
Victoria Range.

Going towards Cavendish, the soil for some miles was reddish in appearance from ferruginous elements, evident in the buckshot gravel here and there visible on the surface.

From the Wannon River, forming the Northern limit of former volcanic activity, we went North and East to the

Victoria Range, one of the parallel ranges of the system, where the Hamilton water supply scheme taps the moun-



A Weathered Outlier.

tain streams for the precious fluid, which is conducted to a service reservoir about a mile from the town. This



Castled Crag of Mt. Arapiles.

range was in appearance, structure, and arrangement of rock-masses, very similar to other parts of the Grampians. A white sandstone of a close-grained saccharine appearance occurs here, and steep cliff-faces and imposing shelves of rock persist, in which as a result of long-continued weathering by wind and water, caves have been formed.

This area is very rich in its profusion of wild-flowers.

Returning to Cavendish, we set our course Northwards for Mt. Arapiles, intending to traverse the lake district, of which White Lake is a prominent feature. However, through taking a wrong turning, we came further to the East. Some distance Westward was the detached Dundas Range, the Westerly residual range, marking the Grampians system. The tract is lightly-timbered country from the Wannon to the Glenelg, one of our longest rivers, 290 miles in length, which rises in the heart of the Grampians, East of the Victoria Range, and is peculiar in having all its tributaries, including the Wannon, on its Eastern side. It drains a considerable part of the whole mountain system, viz., the Serra, the Victoria, the outlying Dundas Ranges, and part of the Black Range. The Norton, MacKenzie, and Little Wimmera rivers, with Mt. William Creek, flowing generally North-west, closely drain the watershed of the Northern and Eastern section of the mountain system. Thus, on crossing the Glenelg River, in and near the bed of which the underlying granite is disclosed, we came on to the expanse of plain extending west of the Black Range and the Glenelg and Norton rivers, to and beyond the South Australian border. These plains are noted for the great number of their lakes, much smaller, but more numerous and scattered than the lakes which open out along the course of the Wimmera.

The area in which they occur in the County of Lowan seems to have generally only a gentle slope in a Westerly direction towards the South Australian border. This trend seems to be away from just North of the Glenelg River, and from the base of the Black Range; and there is evidently a similar and almost imperceptible fall from the foot of Mt. Arapiles. On the East the average height of the plain is about 500 feet above sea level, and about 300 feet at the border of South Australia.

Though there are hundreds of lakes, both fresh and salt, there are no defined rivers or continuous water-courses, the absence of appreciable grade, combined with

the porosity of the soil, and excessive evaporation of surface water, militating against the formation of surface streams. The surface water evidently makes its way inconsequently from depression to depression, or by soakage underneath towards South Australia.

In winter, as Major Mitchell found in 1836, progress is extremely difficult over this flat or slightly undulating water-logged area—a succession of lakes and swamps, with soft, muddy surroundings.

These lakes are shallow, saucer-shaped depressions, some with fairly steep banks, in which appear white patches of the earthy limestone, occurring generally beneath the soil in this wide area. As salt is abundant in the soil, and the lakes rarely have outlets, the water which they contain is usually salt, encrustations being formed after free evaporation, or sometimes on the banks after the prevalence of strong winds, especially from the West.

As in most places where limestone is abundant through the soil, the depressions have been caused by water dissolving and carrying off some of the lime, thus forming cavities into which the overburden of earth subsides, forming a basin of greater or lesser extent. The shifting, uneven, crabhole surface noticeable in the Wimmera Plains seems to be due to similar action on a smaller scale—removal of lime from the earth content by water action, then consequent subsidence of the surface.

The nature of any surface rock in an area of this kind, where sometimes there is great soakage, at other times excessive evaporation, has been usually determined by the character of the underlying material and the composition of the percolating waters. Thus water containing iron salts in solution, and evaporating at the surface would form ironstone of some kind; in water becoming alkaline, the solution would dissolve silica, as in sand grains, if present in contact, and, evaporating, would leave it in the form of chert or quartzite.

Where the water coming to the surface holds lime in solution, as is the case over this extensive plain, deposition of lime would take place on the evaporation of the water. With salt as the substance in solution, a similar result would happen.

These plains, stretching Northward and Westward, occupy a part of the basin of the great Murray Estuary of Tertiary times, which, according to geological evidence, probably extended as far North as Menindie, on the Darling, and from Swan Hill, on the Murray, to the Cambrian

slates and quartzites of the Mt. Lofty Range, in South Australia, the presence of the ancient sea-floor, marine sediments, and shell remains, abundantly evident as disclosed by boring operations, and also extensive fossil deposits at several exposed places throughout the area, clearly testifying to the former existence of this extensive estuary.*



The Northern Plains.

Into this inlet of Tertiary times, the streams now represented by the Darling, the Lachlan, with the Murrumbidgee, and the Murray River, entered as independent streams. Gradually, elevatory agencies and deposition in the later Tertiary period caused the withdrawal of the sea from the estuary, and eventually the rivers became engrafted in one system, as at present.

Parallel cases of estuaries undergoing a similar, if less extensive, process of contraction, may be noted in Corner Inlet and in the Gippsland Lake Basin, both greatly contracting from without and within, so that the operation of even a moderate uplift at some future time would result, as was the case in the Murray Estuary—in slow emergence as dry land. The Latrobe River already ex-

*See p. 120, "The Geography of Victoria," J. W. Gregory, D.Sc., F.R.S.

hibits a parallel capture of formerly independent streams—the Thomson, Alberfeldy, and Macalister rivers.



From *The Geography of Victoria*, by J. W. Gregory, D.Sc., F.R.S.

Thus, over these far-spread plains of Lowan, with their excess of lime and salt in the earth, substances readily removable in solution by water, and as readily deposited in surface evaporation, these many depressions and the character of the surface soil have been produced by subsidence, consequent on the removal of lime, salt, or gypsum.

After crossing the Glenelg, past Fulham, we investigated a salt lake showing the characteristics above mentioned, gypsum and salt being visible on its border. Several of these lakes were observed as we passed on Northwards to Mt. Arapiles. At Lake Clear, of fresh water, 300 acres in extent, we stayed in observation. A number of dead trees were in its bed, telling of some change of conditions in the lake. At a smaller lake further on, a

large flock of wildfowl, about three hundred in number, rose in rapid flight. This lightly-timbered part of the country was apparently good pastoral and wheat land. At Mt. Arapiles we camped in a sheltered and shaded valley. The Mount, named by Major Mitchell, after a place near Salamanca, in Spain, is 1,126 feet in height. It is a residual much-weathered outlier of the Grampians system. From the summit of the mount an extensive view is obtained. Major Mitchell mentions having counted 27 lakes within view. Just to the North is the compact and detached mass called Mitre Rock, with Mitre Lake, of salt water, 1,280 acres, not far distant.



Mitre Rock and Lake,
North of Mt. Arapiles.

On the bold face of the turreted peak of Arapiles a tablet commemorating Major Mitchell has been placed.

Leaving this rocky outpost, we passed over the fertile wheat fields of the Natimuk and Horsham districts, and, skirting the Boga Lakes, made our way to Mt. Zero, a Northern peak of the Grampians, so named by Mitchell as a record of winter experience. Here, as in many approaches to the Grampians, the depth and the extent of sand are evidence of the great denudation that has taken place in the mountain sandstones.

A tramway has been laid down from Horsham, and a large quarry opened for obtaining blocks of sandstone, chiefly in use for facing the water-channels, which are so great a feature, and so acceptable a boon in the scantily watered North-western districts.

The sandstone is very white, evenly-granular, and almost like loaf-sugar in appearance, but in general character resembles the formations elsewhere observed in the ranges. Although carefully looked for, no traces of organic remains were found.

The range at Mt. Zero still preserves its rugged, massive, and imposing appearance, and is well covered with characteristic growth of vegetation.



The Quarry at Mt. Zero.

Our course was next taken by way of Dadswell's Bridge, to Lake Lonsdale, situated East of the Grampians, about 8 miles from the town of Stawell. Formerly an expansion along the course of the Mt. William Creek, by the construction of an artificial bank, the lake was increased in extent to 6,000 acres, and in conjunction with Lake Wartook, West of the Grampians, is now a valuable storage reservoir for irrigation and water supply to the Northern plains.

West of the lake is Mt. Dryden, a sentinel-like peak of igneous origin, standing out in front of the main range of stratified rocks. Lake Lonsdale was a much-frequented camping place of the aborigines, and their chipping-grounds on sandy patches give evidence of long occupation. For stone implements they used, in addition to quartz and quartzite, the stone of hard texture from the vicinity of Mt. Dryden.

BOTANICAL REPORT.

BY H. B. WILLIAMSON, F.L.S.

MOUNT STURGEON AND MOUNT ABRUPT (First Camp).

The eastern slope leading up to the sandstone precipices is well wooded, the principal Eucalypt being *E. obliqua*, L'Herit., in a rather small, diffuse form. So abundant are these trees on the East and South that when in bloom they present a mass of white blossom, easily seen from Dunkeld, about two miles away. A few small trees of the Broad-leaved Peppermint, *E. dives*, Schauer, appear on the higher slope. This species is remarkable for flowering early, and producing a great quantity of fruit. From one specimen in the sapling stage, not more than ten feet high growing in this locality I gathered in 1894 dense heads somewhat over an inch in diameter, containing more than 30 capsules. The species was at that time held to be a form of *E. amygdalina*, Labill. *E. macrorrhyncha*, F.v.M., and *E. viminalis*, Labill., are also seen here, and *E. ovata*, Labill., occurs in the damper ground near the Wannon River. Other trees noted on the Mount were Blackwoods, Black Wattles, *A. mollissima*, Willd., Sheokes, *Casuarina stricta*, Ait., Cypress Pines, *Callitris cupressiformis*, Vent., and a few shapely specimens of the Cherry Ballart, *Exocarpus cupressiformis*, Labill. The slope approaching the Eastern wall of the Mount consists of course of the sandy detritus weathered from the cliffs, and is covered with shrubby vegetation of much the same character as the "Sandringham" flora, e.g., Silky Tea-tree, Dwarf Banksia, *B. marginata*, Cav., Shrubby Sheokes, the three common Guinea-flowers with the Flat-peas, Bitter-peas, Parrot-peas, Bush-peas, and Horny Cone-bush, all well-known in the Melbourne district. Interspersed among these familiar plants are shrubs peculiar to Western Victoria, which make the place interesting to plant collectors; for example, the snow-white *Conospermum Mitchellii*, Meiss., the Holly Grevillea, *G. aquifolia*, Lindl., and the Flame Heath, *Astroloma conostephioides*, F.v.M., all of which were once very abundant here, but fires and grazing animals have caused sad devastation among our rarer plants. The last-named plant, with its bright red flowers, is interesting, as providing food for, and being served by one of our smallest of birds, the Spinebill, and also by our largest bird, the Emu, the former visiting the flowers for honey in the early stages, and the latter feasting on the advanced flowers enclosing the ripe berries, a

dual case of co-adaptation in Nature. The rare *Brachyloma depressum*, Bth., a prickly diffuse shrub, with white, tubular flowers, very sweetly scented, was noted on the upper part of the slope. From the site of our camp near the Wannon bridge, the road is rather steep, though very well made, to the top of the "Gap" leading over to the Victoria Valley. This Gap is the saddle between Sturgeon and the Picaninni, a small elevation connecting with Mount Abrupt, and has long been a favourite objective of flower gatherers. If, since my previous visit 30 years ago, the zeal for carting home great bundles of bush flowers has continued, with the added facility provided by the use of motor cars, one must include that as one of the causes of the devastation referred to. Along this Gap road, and on either side of it, many shrubs of an interesting Bush-pea once grew. Our search revealed only three bushes. Mueller's determination of this plant, at one time as *Pultenaea mollis*, Lindl., and at another (my specimens), as *P. viscosa*, R.Br., is evidence of the confusion that existed in this group of plants. In my Revision of the Genus, *Proceedings of the Royal Society of Victoria*, Vol. XL., Part 2, it is shown that *P. viscosa* does not occur in Victoria, that *P. mollis* occurs only, as far as is known, in the Southern Grampians, and probably on the Glenelg River, and that the plant from further North and from Mt. Macedon, Gembrook, etc., should take specific rank as *P. angustifolia* (Mueller's ms. name). Another rare plant, for which unsuccessful search was made, was *Pleurandropsis phebaloides*, Baill., a small Rutaceous shrub with yellow flowers, reminding one somewhat of the Showy Guinea-flower. The Southern slope of the Picaninni, where this once grew, now gives one the idea of an occasional sheep camp or goat run. It was on the western slope of the same hill that the Serra Grevillea, *G. Williamsonii*, F.v.M., was discovered (1893). One bush only was known, and this was destroyed by fire two years later. Repeated searches during the 12 years following failed to reveal another specimen. Revisiting the spot brought a surprise, inasmuch as the place was covered with dense scrub, Silky Tea-tree and other hardy shrubs, not at all easy to pass through, yet the fire in 1895 had made a thoroughly clean sweep. There is no doubt about the rejuvenating power of Nature, but there seems also no doubt that the number of species diminishes during the process. A Flora of Victoria written after a general holocaust, and a subsequent

natural restoration, would be a comparatively simple matter, that is, if old records were ignored. It was refreshing, after a tiresome struggle up a gorge in the precipitous wall of Sturgeon, to plunge into a veritable wild-flower garden, and revel in the splendour of massed blooms of the Snow Myrtle, *Lhotskya alpestris* (Lindl.), J. M. Black, Olive Grevillea, *G. oleoides*, Sieb., Fringe



Snow Myrtle, *Lhotskya alpestris* (Lindl.),
Mt. Zero.

Myrtle, *Calytrix tetragona*, Labill., and various Daviesias, Dillwynnias, Pultenaeas, and Senecios. Large bushes occur also of *Correa aemula*, F.v.M., a plant with drooping greenish flowers, which is known only in the Grampians. A feature of the southern slopes of this peak is *Ixiodia achilleoides*, R.Br., which forms a mass of scrub from 3 to 5 feet in height, and spreads over a large extent of the messmate forest. It is a composite, with papery expansions of the outer bracts, like an everlasting, and blooms about April.

Looking from the summit, one notes how the River Wannon, which has come down from Mt. William, through the long, straight valley between the Serra Range and the Eastern foothills, skirts the base of Sturgeon, and then turns in a north-westerly direction towards Cavendish. One also marks the park-like char-

acter of the country round Dunkeld, which is characterized by the presence of fine bushy specimens of Red Gum, *E. rostrata*, Schlech., and well grassed areas, and by the absence of scrub or young trees. This is the character of the country also towards Glenthompson to the east, and Hamilton to the west, except that in the latter case red gums are not so much in evidence. Further south, towards Penshurst, 18 miles, and Hawkesdale, 36 miles, one looks over a typical Western District basalt country, and notes the almost complete absence of forest areas. Scarcely any species of Eucalypt occur in this area, right along to the seaboard, but Manna Gum, *E. viminalis*, and Swamp Gum, *E. ovata*, and a few *E. rostrata*, near the watercourses. Wide stretches occur where only perhaps a dozen trees to the square mile may be seen. Interspersed among these Blackwoods and Sheokes, *Casuarina stricta*, Ait., with a few Black Wattles, take a secondary place. Coming down to the base of the rocky wall, plants of the Slender Rice-flower, *Pimelea linifolia*, Sm., the attractive feature of which is the cross-like arrangement of the leaves (decussate). It is not a common plant. Specimens of *P. spathulata*, Labill., have probably been erroneously recorded from some localities under the name *linifolia*. The latter is distinguished by the recurved margins of the leaves.

MOUNT ABRUPT.

At the entrance to the gorge up which the ascent of Mt. Abrupt was made, plants of the Grampians Gum, *Euc. alpina*, Lindl., with its leathery leaves and large sessile, warty fruits, were passed. They were, as usual, dwarf trees about 10 feet high. Fine bushes also of Bentham Bush-pea, *Pultenaea Benthamii*, F.v.M., were noted. This plant was thought to be confined to the Grampians till recently, when it was found in East Gippsland by Mr. T. S. Hart.

VICTORIA RANGE (Second Camp).

The pipe-head of the Hamilton water supply, consisting of a small basin, is situated near the opening of an amphitheatre in the Western Grampians (Victoria Ranges), 15 to 20 miles from Cavendish. This basin is supplied by natural watercourses, and by drains cut into the extensive springs above it. The amphitheatre is only a few miles across, and is bounded on the east by the ridge which separates the Wannon basin from the

basin of the Glenelg, which takes its rise only a few miles away. The vicinity of the basin pipe-head is interesting, as being the type locality of three species of Bush-pea, *Pultenaea Luehmannii*, Maiden, *P. Readeriana*, H.B.W., and *P. Maidenii*, Reader, all first collected there in 1903. On this visit I failed to find the last-named, but the others were gathered, the first-named a slender trailer, found growing on the edge of the basin, and the banks of the stream below (found also later at Mt. William, J. W. Audas), and the latter, rather large bushes, on the rocky ground near by. Since *P. Readeriana* was described, it has been found that the species common in the Dandenong Ranges, and at Pakenham and elsewhere, and hitherto determined in error, as *P. villosa*, Willd., can be referred to *P. Readeriana*. The margins of the springs were searched, and another Bush-pea, *Pultenaea*



On the track to Victoria Range.

subumbellata, Hk., was found in bloom amongst the usual associates of swamp plants, common bog-rushes and sedges, the most interesting of these were the Button Bog-rush, *Gymnoschoenus sphaerocephalus*, Poir., with its button-like flower-heads on tall, straight scapes, the slender Bog-rush, *Schoenus tenuissimus* (Hk.f.), Benth., and the Needle Bog-rush, *Tricostularia pauciflora*, Benth..

the last-named confined to the Grampians. A walk up the eastern slope over a recently fire-swept area resulted in the finding of the prostrate *Mitrasacme pilosa*, Labill., and a few male plants of *Opercularia scabrida*, Schlecht., but little of interest was noted till near the top of the ridge, when shrubs about 9 feet high of *Pultenaea angustifolia*, H.B.W., were found in full bloom. Thus specimens of the plant hitherto known as *P. mollis*, Lindl., were in hand for comparison with those of the true *P. mollis* gathered at Mt. Sturgeon, confirming the author in his decision with regard to the new species name. From the summit one overlooked the sources of the Glenelg River, which from here flows for over 20 miles in a north-easterly direction through a spring-choked valley, and some button-grass plains. On this height a better show of flowers was met with, the most striking being the Hairy Boronia, *Boronia pilosa*, Labill., with its pink flowers and aromatic foliage, not altogether pleasant to the nostrils. The descent was made over an extent of rocky ground thick with undergrowth, Silky Tea-tree and other common native plants, among which the Sweet Appleberry, *Billardiera cymosa*, F.v.M., climbed here and there. Along the little stream leading into the springs supplying the basin, numerous plants of the Forked Sundew, *Drosera binata*, Labill., were noted. An interesting representative of *Restionaceae* *Lepyrodia scariosa*, R.Br., and a curious tall grass, *Stipa Muelleri*, Tate, were gathered. Both these plants were recorded from this locality in 1903 as new for Victoria. The latter was since found quite common in the Ringwood district, which, along with the case of *Pultenaea Weindorferi*, Reader, shows how easily a species can be passed over, even by experienced collectors. Honours for splendour of blooms, however, might be awarded to the rocky heights which stand like Pillars of Hercules at the entrance of the amphitheatre. On the northern cliffs the massed blooms of large flowering shrubs of the Shrubby Velvet-bush, *Lasiopetalum dasyphyllum*, Sieb., wreathed profusely with the foliage and dainty little bells of the Orange Bell-limber, *Marianthus bignoniaceus*, F.v.M., made a fine show in itself, but in the picture one must include lovely bushes of Snow Myrtle, *Lhotskya*, shrubs of the large-flowered variety (*grandifolium*) of *Leptospermum lanigerum*, Sm., the profuse blooms of *Dillwynia ericifolia* var., as well as some purplish racemes of Austral Indigo, and the yellows and reds of a

few Bush-peas. The *Dillwynnia* named is peculiar to the Grampians, a long-leaved form with large bright yellow flowers.

The approach to this locality from the Cavendish-Glen Isla road was across a scantily-grassed alluvial plain, covered with Red Gums and Swamp Gums, and interspersed with clumps of Blistered Paper-bark, *Melaleuca halmaturorum*, F.v.M., and Miq., growing in shallow water, which had to be forded in a few places. Patches of Black Bristle-rush, *Chorizandra enodis*, Lehm., and several species of *Leptocarpus* take the place of more useful vegetation. Nearer the hills the track leads through sandy and heathy scrub, fairly well timbered with small stringybarks, *E. Blaxlandii*, Maid and Cabbage. Here the vegetation is of the "Sand" type, such as one can find near Melbourne, but rendered specially



Conosperm and Calectasia,
near Victoria Range.

interesting to visitors by the presence of some plants restricted to the Western District, notably the two *Conosperms*, *C. patens*, Schlech., and *C. Mitchellii*, Meiss., the latter being specially fine, Prickly Grevillea, *G. aquifolia*, Lindl., Beaked Hakea, *H. rostrata*, F.v.M., and the much

admired Blue Tinsel Lily, *Calcectasia*. These, with frequent bushes of Lavender Grevillea, *G. lavandulacea*, Schlecht., with its bright pink flowers, the Downy Rice-flower, *Pimelea octophylla*, R.Br., and some white Everlastings, *Helichrysum Baxteri*, A. Cunn., and *H. obtusifolium*, Sand. and F.v.M., made a scene in which one delighted to linger.

FULHAM.

This tract of open grass country, scantily timbered with Red Gums, Manna Gums and Sheokes, showed signs of having suffered from drought, and few plants were noted in bloom. The only ones collected were on the railway line near Fulham:—*Halorrhagis heterophylla*, Brongn., *Helipterum incanum*, D.C., *Calotis anthemoides*, F.v.M., *Trichinium macrocephalum*, R.Br., and *Eryngium rostratum*, Cav., the last two being scarcely past the bud stage.

MOUNT ARAPILES (Third Camp).

The flora of this peculiar isolated hill was investigated about 40 years ago by Mr. St. Eloy D'Alton, and in his



Common Fringe-Myrtle, *Calytrix tetragona* (Labill.),
Mt. Arapiles.

notes on the *Plants Indigenous to the North West Portion of the Colony of Victoria*, read before the Australasian Association for the Advancement of Science, Jan. 11th,

1898, he tells of the rare plants found there. On the occasion of our visit, evidence was plain that fires and grazing animals have been making sad havoc among the native flora, and although a few bushes still remain of some rare plants, a general trend towards extinction is going on. A feature of the existing vegetation on the Mount is the strong growth of the Fairy Wax-flower, *Eriostemon obovalis*, A.Cunn., Fringe Myrtle, *Calytrix tetragona*, Labill., and Wallowa, *Acacia calamifolia*, Sweet. The last-named is abundant both on the summit and at the foot, and bushes 15 feet in height were noted. Small bushes of the Rock Acacia, *A. rupicola*, F.v.M., are still growing in the grass paddocks round the Mount, but they will not last long with the present treatment of the reserve. This Acacia, which is one of the rarest of our species, has spiny phyllodes resembling those of *A. diffusa*, Edwards, but less rigid, and is remarkable



Fairy Wax-flower, *Eriostemon obovalis* (A. Cunn.),
Mt. Arapiles.

for emitting a pleasant odour when bruised. No Acacia was seen in bloom. Two pretty shrubs noted by Mr. D'Alton were missed, as they also were by me in 1899, viz., the Blue Howittia, *H. trilocularis*, F.v.M., occurring in the Grampians, and in other districts, and

the Spiny Mint-bush, *Prostanthera spinosa*, F.v.M., probably our rarest in the genus. They probably grow at the foot of the mount furthest from our camp, where time did not permit of our searching. Five bushes of the Euphorbiaceous plant, *Phyllanthus Gunnii*, Hk., were noted, three of which bore staminate flowers only, and the others only pistillate flowers. This is apparently *P. Gunnii*, Hk., var. *saxosus*, F.v.M. (*P. saxosus*, F.v.M.) collected by Dallachy at "Wimmera," which locality probably includes Arapiles. Bentham and Mueller evidently agreed to unite this with our Eastern form. Hooker's description of *P. Gunnii* states "flowers monoecious," yet we have specimens from the East, T. S. Hart, which are dioecious. In the *Casuarinac* we have examples, e.g., *C. suberosa* where, although the plant is usually monoecious, we occasionally find trees with flowers all of one sex. In my opinion, owing to the remarkable resemblance between the Eastern and the Western forms, we should keep them both under *P. Gunnii*. At the top of the gorge two male plants of *Pimelea elachantha*, F.v.M., with the inappropriate vernacular, "Coast Rice-flower," were seen. This belongs to the section of the genus which contains dioecious flowers. It is a plant rarely gathered. A few bushes of the Solanaceous plant, Oondoroo, *Solanum simile*, F.v.M., still grow near the summit. This shrub resembles Kangaroo Apple, except that the leaves are rarely lobed and not so acute, the flowers smaller, and the berries purplish instead of green or yellow. It is not recorded away from the North-West. Another plant of the same family, Large-leaf Ray-flower, *Anthocercis frondosa* (Miers), J. M. Black, (*A. Eadesii*, F.v.M.), recorded from Arapiles and the Northern Grampians was noted, but since 1899 many of the bushes have disappeared. It is a shapely shrub with masses of white, star-like flowers reminding one of the bloom of Jasmine. By far the most prevalent Eucalypt on the Mount is Long-leaf Box, *E. elaeophora*, F.v.M. Manna Gum and Messmate, Stringybark are also represented, and on the flat below good trees of Yellow Gum, *E. leucoxylon*, F.v.M., grow. Near these were seen some fine trees of the Weeping Pittosporum, *P. phylliraeoides*, D.C. Its graceful, drooping branches loaded with yellowish flowers, give it a charm that few of our smaller trees possess.

MITRE ROCK.

An hour was spent on this isolated mass of rocks, but except that the rare Skeleton Club-moss was found, nothing fresh was met with. This plant, *Psilotum nudum*, L. Grieseb. (*P. triquetrum*, Sw.) was first recorded for Victoria from Mr. D'Alton's specimens sent to Baron von Mueller about 40 years ago. I gathered it on my visit in 1899, and it is satisfactory to report that it is still abundant in clefts quite out of reach.

MOUNT ZERO (Fourth Camp).

The time (one day) spent at this camp could have been extended with interest and profit, for its proximity to the Mallee country, and the rugged and difficult nature of its rocky heights render it likely that novelties may yet be found there. It appears to have suffered less from the ravages of fire than the other places we visited. For my part, I would have been glad of the opportunity of seeing more of a field which I had not previously searched. At least two plants, *Thysanotus dichotomus* (Lab.), R.Br., and *Hibbertia humifusa*, F.v.M., recorded from the place are very rare, and our search for them was unsuccessful. By the track near the tramway leading to the quarry, where we were to pitch camp our leader was fortunate enough to gather a *Caladenia* which is likely to be described as a species new to Science, and early the next morning Mr. Barrett surprised the party by returning to camp bearing specimens of Skeleton Club-moss, which until then had been recorded only from Mitre Rock. This discovery was hailed with cheers, and led to evidence being obtained later in the day that the plant grows abundantly in crevices in the rocks around the quarry. Its forked, yellowish branches make it an easily recognised plant, though it may have been previously passed by as a young plant of *Exocarpus*. It is also found pendent from trees in New South Wales and Queensland. Linne's name for the plant was *Lycopodium nudum*, and Swartz was in error in changing the species names when he removed it to the genus *Psilotum*. Griesebach later made the necessary correction. It occurs in many parts of Europe, Africa and America, as well as in the States mentioned. The chief feature of the road from Horsham to Stawell is an extensive Box forest, apparently fine bee country, Yellow Box and Grey Box being the prevailing trees. Some large bushes of the Scarlet Bottle-brush, *Callistemon rugulosus*, D.C.,

were noted near the road. which is often just a good bush track.

Four species of *Pultenaeae* were collected, two of which being of special interest. Near the sandy track on the way to the Mount, *Pultenaea laxiflora*, Bth., by no means a rare species, was found, and the common *P. dentata*, Labill., was gathered by a damp creek bed near the camp. On the rocky hillside leading to the summit of Zero, bushes were seen of what I place provisionally as *P. hispidula*, R.Br. Mueller's label on specimens which he collected at this spot is *P. lanata*, A. Cunn. Bentham placed it, wrongly, I think, with *P. villosa*, which seems to have been a dumping ground for several doubtful forms. It appears to be close to both *P. hispidula*, R.Br., and *P. Readeriana*, H.B.W. Another species which grows straggling among



Disintegrating Rocks,
Mt. Arapiles.

the Tea-trees and other scrub in the damp creek bottoms has been labelled "*P. mollis*, Lindl.," by Mueller and others, and it approaches the species referred to above (Victoria Ranges) as *P. angustifolia*, H.B.W. In my revision I have placed it as var. *viscosa* of that species, but it will probably have to be given specific rank. Asso-

ciated with this Bush-pea was the showy Violet Westringia, *W. glabra*, R.Br. With its dark green, glabrous leaves, and its dark purple flowers resembling those of the Mint-bushes, it helped with masses of the Orange Bell-climber, to make an eye-feast for the flower lovers of the party.

The slopes and rocky ledges of Mount Zero are rich in the typical showy shrubs of the Grampians, including the Small-leaf Wax-flower, *Eriostemon gracile*, Graham (*E. difformis*, A. Cunn.). Star-hair bush, *Astrotricha ledifolia*, D.C., a particularly fine form invested with woolly hairs, Large Ray-flower *Anthocercis* (noted at Arapiles), Winged Spyridium, *S. vexilliferum*, Reiss, Slender Conosperm, *C. patens*, Schlech, and many others mentioned already. The Eucalypts comprise mainly *Euc. elaeophora*, and the two Stringybarks, *E. macrorrhyncha* and *E. obliqua*. The two latter were intermingled on the sandy country at the base of the Mount. This level tract showed evidence of having been recently burned, so that few plants of interest were found except the little Silverweed Lily, *Bartlingia sessiliflora* (Dene), F.v.M., and the Foxtail Mulga-grass *Neurachne alopecuroides*, R.Br. In a sheltered mossy recess early flowers were noted of the Bristly Trigger-plant, *Stylidium soboliferum*, F.v.M., distinguished by its dense rosettes of linear leaves with bristly points. We have about 60 plants endemic within our State, 25 per cent. of which, including this plant, are found only in the Grampians. Among other plants found in bloom near this camp were:—Two Mint-bushes, *Prostanthera rotundifolia*, R.Br., and *P. denticulata*, R.Br., two Grevilleas, *G. alpina*, Lindl., and *G. ilicifolia*, R.Br., *Brachyloma ericoides*, Sond., *Melichrus urceolatus*, R.Br., *Micromyrtus ciliatus* (Sm.), J. M. Black, and *Boronia polygalifolia*, Sm.

LAKE LONSDALE.

This has a desolate aspect from a botanist's point of view. On the sandy hillocks round its shores, where bracken and the introduced grass, Brome Fescue, *Festuca bromoides*, L., constitute the main feature, some specimens of the curious Flannel Cudweed, *Gnaphalodes uliginosum*, A. Gray, and the Common Bow-flower, *Toxanthus Muelleri*, F.v.M., were the only plants gathered.

About 250 plants altogether were noted in flower or fruiting. A good many of these were collected, and the National Herbarium has materially benefited by a valuable addition of specimens.

ENTOMOLOGICAL REPORTS.
FORMICIDAE.

BY JOHN CLARK, F.L.S., Entomologist, National Museum.

The collection is a small one, and certainly not representative of the area traversed. Most of the specimens obtained belong to widely distributed species. The collection contains examples of two new species. One of these is of particular interest, being the first specimen of a genus, *Epitritus*, not previously recorded from Australia. This genus is found in New Guinea.

Family FORMICIDAE.

Sub-family PONERINAE.

AMBLYOPONE AUSTRALIS, Erichson.

Arch. f. Naturgh. 8, p. 260, 1842; Wheeler, Proc. Amer. Acad. Arts and Science, 62, 1, p. 7, f.l., 1927.

Two workers from Dunkeld and two from the Grampians. This species is widely distributed throughout Southern Australia and Tasmania.

MYRMECIA SIMILLIMA, Smith.

Cat. Hym. Brit. Mus. 6, p. 144, 1858.

Three workers from the Grampians.

A common species in New South Wales. It does not appear to be abundant in Victoria.

MYRMECIA DESERTORUM, Wheeler.

Trans. Roy. Soc. S. Aust. 39, p. 805, 1915.

Nine workers and two females from Clear Lake district.

Widely distributed throughout the central portion of Australia. It has been recorded as both *vindex* and *nigriceps* from the material collected by various scientific expeditions to Central Australia.

MYRMECIA (PROMYRMECIA) PILOSULA, Smith.

Cat. Hym. Brit. Mus. 6, p. 146, 1858.

Eight workers and one female from the Grampians, and three workers from Mt. Arapiles.

A very abundant and widely distributed species. It is found in all the States. Commonly known as the "black jumper."

ACANTHOPONERA IMBELLIS, Emery.

Ann. Soc. Ent. Belg. 39, p. 346, 1895.

Four workers from Mt. Sturgeon.

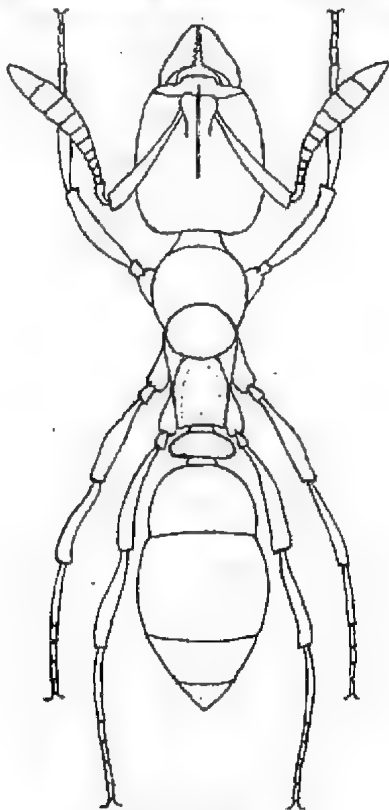
Found throughout South-East Australia, but not abundant. This ant feigns death on being disturbed. It lives in small colonies.

CHALCOPONERA METALLICA, Smith.

Cat. Hym. Brit. Mus. 6, p. 94, 1858.

Two workers from Dunkeld.

One of the most widely distributed ants in Australia, it is also one of the prettiest. The nests of this species usually contain various Myrmecophilous insects.



Ponera sulciceps, n.sp.
Dorsal view of worker.

PONERA SULCICEPS, n.sp.

Worker. Length 2.3—2.8mm.

Brown, mandibles, clypeus and antennae reddish yellow, legs yellow.

Pilosity yellowish; very abundant, short and adpressed.

Semi-opaque. Mandibles shining, with a few scat-

tered fine punctures. Head very finely and densely punctate. Scapes of the antennae microscopically punctate. Pronotum finely and densely punctate, particularly in front. Epinotum more coarsely punctate. Mesonotum smooth, feebly shining. Gaster very finely and densely punctate.

Head longer than broad, broader behind than in front, the sides convex, the occipital border concave, the angles rounded. Mandibles triangular, the terminal border straight, armed with seven teeth, the inner border edentate. Clypeus rounded, and projecting in front at the middle, strongly rounded and raised at the centre above; there is a sharp carina behind, but it is hardly indicated in front. Frontal carinae closely approximated, hardly diverging behind; there is a well defined groove between the carinae, extending from the anterior edge to a little beyond the centre of the head. Eyes very small, placed on the lateral border in front, about three times their diameter from the base of the mandibles. Antennae short and thick; scapes barely reaching the occipital border; first joint of the funiculus longer than the three following joints together, all the joints from the second to the tenth slightly broader than long, the apical joint longer than broad and pointed. Thorax twice as long as broad through the pronotum, the latter convex in front and on the sides, very feebly rounded above. Mesonotum oval, broader than long, slightly convex and rounded above. Epinotum constricted at the base, the epinotal declivity abrupt. Node fully twice as broad as long, the anterior face slightly convex, the posterior face flat; in profile, it is fully three times higher than long, with a broad tooth-like projection in front below. Post-petiole one and three quarter times broader than long, convex in front and on the sides. First segment of the gaster broader than long, as broad in front as behind, the sides convex. Legs long and slender.

Hab.—Mt. Arapiles; four workers. Five examples of this species were taken at Bacchus Marsh in 1922 by Mr. F. E. Wilson. Type in National Museum.

Sub-family MYRMICINAE.

PODOMYRMA ELONGATA, Forel.

Ann. Soc. Ent. Belg. 39, p. 428, 1895.

A single worker from the Grampians.

The ants of this genus are tree-ants. They are destructive to forest trees, as they construct their nests in the trunk and branches.

PHEIDOLE, ? sp.

Three minor workers from Clear Lake district. They cannot be identified without the major workers, or soldiers.

MERANOPLUS FROGGATTI, Forel.

Bull. Soc. Vaud. 49, p. 183, 1913.

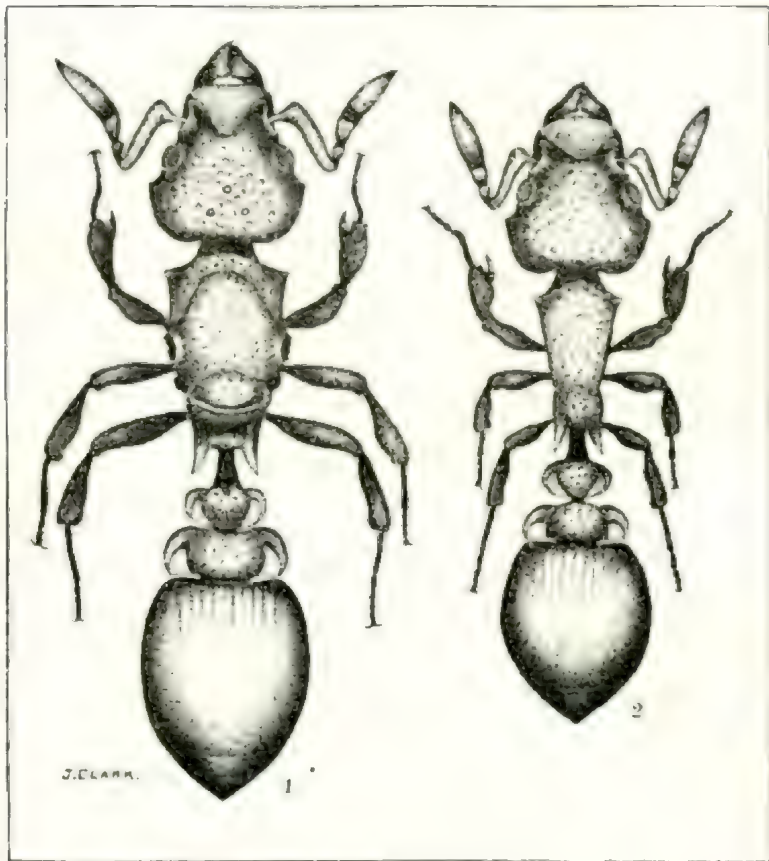
A small colony from Victoria Range.

A harvesting ant which appears to be confined to the Mallee.

MERANOPLUS HIRSUTUS, Mayr.

Jour. Mus. Godeffroy 12, p. 112, 1876.

A single worker from Mt. Arapiles.

*Epitritus Elliotti*, n.sp.

1. Dorsal view of female. 2. Dorsal view of worker.

EPITRITUS ELLIOTTI, n.sp. (Pl. Figs. 1-2).

Worker. Length, 2.2mm.

Reddish yellow. Metanotum and both nodes brownish, a brownish patch on the clypeus and vertex, the first segment of the gaster has a large brownish patch

near the middle, with two small spots between the patch and the posterior margin, on each side of the segment a brown mark extends from the base to the apical third, the posterior margin also is brownish; antennae, tarsi and the membranous appendages of the nodes yellowish.

Pubescence yellow, very short and adpressed, noticeable only on the antennae and legs.

Shining. Head, thorax and nodes somewhat coarsely but superficially reticulate-rugose; mandibles, scapes of the antennae and the legs microscopically reticulate. First segment of the gaster longitudinally striate at the base, the striae not extending to the middle of the segment.

Head, excluding the mandibles, as long as broad, broadest just behind the eyes, where it is twice as broad as on the front of the clypeus; the occipital border concave, the posterior angles strongly rounded to the posterior third of the head, forming a sharp angle just behind the eyes; from this angle the sides are rapidly narrowed to the front. Mandibles elongate triangular, terminating in a rather long sharp tooth; the inner border carries only one tooth, near the apex, this is similar in size and shape to the apical tooth. Clypeus broadly rounded in front, twice as broad as long, a well defined suture separating it from the front. Eyes large, placed almost at the middle of the sides of the head. No ocelli. Antennae short and robust, four jointed; scapes, near the base, about one-third as broad as long; club of the funiculus two jointed, the apical joint much longer than the two preceding joints together. Thorax barely twice as long as broad through the pronotum, much broader through the pronotum than through the epinotum. Pronotum convex in front, the sides straight, the anterior angles sharp, but hardly tooth-like; all the borders submarginate. There is no trace of a suture between the pronotum and mesonotum; there is, however, an indication of a suture between the mesonotum and the epinotum, also a slight constriction on the sides; the epinotum is armed with two long semi-translucent spines, these are as long as the space between them at their base, they are directed backwards, almost parallel; in profile almost horizontal with a translucent membrane extending from the apex of the spines to the base of the epinotal declivity; the declivity is short and abrupt, the boundary between the latter and the dorsum is rounded. First

node as long as broad, broader in front than behind, the anterior border and sides convex; at each side in front there is a strong spine curved backwards, this spine is attached to the node on its full length by a translucent membrane; in profile the node is higher than long, with the anterior face and the dorsum flat, the angle between the two is rounded. Postpetiole broader than long, convex in front and on the sides, with a spine on each side in front, much longer and stronger than those on the node, the spines attached to the postpetiole by a translucent membrane, similar to that on the node. First segment of the gaster large, as long as broad, and as broad in front as behind; the apical segments small. Legs short and stout.

Female. Length, 3mm. (Dealated).

Closely resembles the worker, differing only in its larger size, possessing ocelli and having the wing sclerites developed. The wings are missing in the present specimen.

Hab.—Mt. Arapiles.

Types in the National Museum.

Described from two workers and one female, one of the workers slightly damaged. At the request of the committee, this fine species has been dedicated to Mr. R. D. Elliott, Acting Chairman of the National Museum Committee.

This is the first record of this genus from Australia.

Sub-family DOLICHODERINAE.

IRIDOMYRMEX RUFONIGER, Lowne.

The Entomologist, Lond. 2, p. 279, 1865.

Four workers from Victoria Range.

Widely distributed throughout Australia. It is a serious house pest in many districts.

Sub-family FORMICINAE.

ACANTHOLEPIS, sp.

A single dealated female from Mt. Arapiles. This cannot be identified without workers.

CAMPONOTUS (MYRMOPHYMA) CLARIPES, Mayr.

Jour. Mus. Godeffroy 12, p. 64, 1876.

Ten workers from Mt. Arapiles.

A common and widely distributed species. In the tube with this ant was found a small ant-nest cricket.

REPORT.

F. E. WILSON, F.E.S.

The whole of the insects other than ants and crane flies, which were collected on the expedition, were handed over to me by Mr. Chas. Barrett, with the request that I should report on them.

In all, ninety-four species were contained in the various tubes belonging to the following orders:—

Dermaptera, 1 sp.

Hemiptera (Heteroptera), 5 sp.

Hemiptera (Homoptera), 1 sp.

Coleoptera, 84 sp.

Hymenoptera, 3 sp.

As far as the *Coleoptera* are concerned, they mostly belong to well-known forms; but four species are at any rate new to science. Some are rare, and a few of the others, though represented in other collections, have not as yet been worked out. Most of the country traversed has a rich entomological fauna, and the following list must not be taken as at all representative of the area. As no regular entomologist was attached to the party, the fact that some new forms were discovered is very gratifying.

The species, *Docalis pilosus*, was very evidently new, but as Mr. H. J. Carter has been specialising upon the family to which it belongs for many years, I asked him to describe it, which he kindly consented to do.

DERMAPTERA.

Labidura truncata, Kirby.

An adult and an immature example of this common insect were taken at Lake Lonsdale.

HEMIPTERA.

[*Heteroptera*.]

Pirates ephippiger. White. Mt. Arapiles.

Four species, all small, belonging to various genera.

[*Homoptera*.]

Bythoscopus, sp.

COLEOPTERA.

CARABIDAE.

Sarticus esmeraldipennis. Cast. Lake Lonsdale,
Dunkeld.

Clivina australis, Boh. Lake Lonsdale.
Mecyclothorax ambiguus, Erich., Arapiles, Mt. Zero.

Morphnus besti, Sloan. Mt. Arapiles.

This fine species, as far as is known, is confined to the Grampians region.

Anchomenus marginicollis, Mael., Lake Lonsdale.

Sarothrocrepis benefica, Newm., Dunkeld.

One of the most widely distributed of the Carabidae.

Notonomus gravis, Chaud. Mt. Arapiles.

„ *molestus*, Chaud. Dunkeld.

Appears to be confined to Western Victoria.

Sarticus impar, Sloan. Dunkeld.

A rare species rather unlike a *Sarticus* in general facies.

DYTISCIDAE.

Lancestes pulverosus, Steph. Mt. Arapiles.

A-most widely distributed species.

Antiporus interrogationis, Clark. Mt. Arapiles.

„ *gilberti*, Clark. Lake Lonsdale.

Platynectes 10, *punctatus*, Fab. var. Mt. Arapiles.

„ *limbatus*, Sharp. Mt. Arapiles, Lake

Lonsdale.

Macroporus howitti, Clark. Lake Lonsdale.

Bidessus praelargus, Lea. Victoria Range.

Copelatus simplex, Clark. Lake Lonsdale.

Necterosoma dispar, Germ. Victoria Range.

Sternopriscus meadfooti, Clark. Mt. Arapiles.

HYDROPHILIDAE.

Hydrobius assimilis, Hope. Mt. Arapiles.

Berosus majusculus, Blackb. Mt. Zero, Lake Lonsdale.

Ochthebius macrognathus, Lea. Mt. Arapiles.

CUCUJIDAE.

Hyliota australis, Erich. Victoria Range.

COLYDIIDAE.

Deretaphrus piceus, Germ. Victoria Range.

„ *viduatus*, Bates. Dunkeld.

Bothrideres illusus, Newm. Victoria Range.

„ *equinus*, Pasc. Victoria Range.

CRYPTOPHAGIDAE.

Atomaria australis, Blackb. Mt. Zero.

COCCINELLIDAE.

Rhizobius hirtellus, Crotch. Mt. Zero.

SILPHIDAE.

- Choleva victoriensis*, Blackb. Mt. Sturgeon.
" sp. Mt. Arapiles.

SCYDMAENIDAE.

- Scydmaenus franklinensis*, Lea. Mt. Zero.

This is a most interesting record. The species was described recently by Mr. A. M. Lea from Franklin Island, a tiny island off the coast of South Australia. I sent it to Mr. Lea and asked him to compare it carefully with the type of his species. He replied, "*Franklinensis*, Lea, slightly paler than type."

STAPHYLINIDAE.

- Quedius tridiventrīs*, Fvl. Mt. Arapiles.
Calodera, sp. Mt. Arapiles.
" " Victoria Range.
Homalota, sp. Victoria Range.
?Genus and sp.

A small insect congeneric with a species I have taken in leaf debris in the Dandenong Ranges, and which Mr. Lea will be working out at a later date.

- Dabira pallida*, sp. Nov.

Reddish castaneous, prothorax and antennae flavous; the whole nitid. More or less uniformly clothed with a very fine pale pubescence, but furnished with long dark setae at apex and sides of abdominal segments, and on undersurface of abdomen.

Head convex, lightly flattened in front, clypeal suture outwardly rounded, an impression beneath basal segments of antennae, and with puncturation close and minute; antennae slender, very gradually increasing in width from beyond second segment; segment 1 about as long as 2 but wider; 3 longer and much narrower than 2; 4 as wide as 3, but barely exceeding half its length; 5 slightly broader and shorter than 4; 6-10 subequal in length, about as long as broad; 11 subovate, pointed, longer than the two but shorter than the three preceding segments. Prothorax twice as wide as long, evenly convex, lateral margins sharply defined, front and hind angles rounded, base rounded but slightly flattened out towards hind angles; with puncturation as on head. Scutellum prominent, very strongly transverse. Elytra about as long as prothorax but a little wider, its front angles rounded and hind lightly produced; with puncturation a little less frequent than on prothorax. Abdomen narrower than elytra, gradually decreasing in width

towards apex. Legs with tibiae slender and straight. Length with abdomen fully extended, 1.75mm. To apex of elytra only, 0.75mm.

Habitat: Victoria, Dunkeld.

This species is the smallest so far described in the genus, and its long slender antennae, apart from anything else, serve to differentiate it from other known species. *Nitida*, Lea (1) has antennae more slender than usual, but considerably more robust than in *Pallida*, and the proportions of the segments are very different. Its hind prothoracic angles are also acute. *Myrmecophila*, Olliff (3), and *Termitophila*, Lea (2), and its var. *Victoriensis*, Lea (1) are very much larger and darker coloured species, with very robust antennae. In *Myrmecophila* also the sides of the prothorax are furnished with strong setigerous punctures. In *Cuneiformis*, Olliff (3) the apical segments of the antennae equal in length the four preceding segments, and in *Convexicollis*, Lea (2) the three preceding. In the latter species also the antennae are stout.



Antenna
of *Dabra*
pallida,
N. sp.

I cannot say if the new species is a *Myrmecophile*, although it is highly probable that it is. The examples of it were contained in a tube with many species of non-*Myrmecophilus* beetles, and two or three species of ants.

Type in National Museum, Melbourne.

PSELAPHIDAE.

Articerus curvicornis, Westw. Mt. Arapiles.

Narcodes, sp. Mt. Zero.

Probably new, but undesirable to describe a species in this genus without the male.

Pselaphus clavatus, King. Victoria Range.

Pselaphus villosus, Lea. Mt. Sturgeon.

CLERIDAE.

Natalis spinicornis, Blackb. Mt. Arapiles.

Not previously recorded from Victoria.

Eleale aenea, Elston.

Not previously recorded from Victoria.

.DRYOPIDAE.

... *Austrolimnius victoriensis*, Carter, M. S. Para-
type, Mt. Victoria.

A small species occurring very frequently in most streams east of Melbourne.

... *Helmis simsoni*, Grouv. Mt. Victoria.

... *Simsonia vestita*, Carter, M. S. Mt. Victoria.

As Mr. H. J. Carter is preparing a monograph on the *Dryopidae*, it was considered advisable that the description of this new species should be included in it, thus keeping the literature on the subject in as compact a form as possible. The committee controlling the expedition agreed to this course. Type in National Museum, Vict. The species is a moderately sized insect, resembling somewhat in appearance the well known species, *H. nicholsoni*, Carter.

BUPRESTIDAE.

Stigmodera decemmaculata, Kirby. Dunkeld.

A widely distributed species.

TRIXAGIDAE.

Aulonothroscus elongatus, Bonv. Dunkeld.

Larger than usual.

ELATERIDAE.

Lacon variabilis, Cand. Dunkeld.

Ascesis australis, Cand. Dunkeld.

Monocrepidius australis, Boisd. Dunkeld.

sp. Dunkeld.

Hapatesus hirtus, Cand. Dunkeld.

TENERIONIDAE.

Chalcopterus variabilis, Bless. Dunkeld.

Platydemia tetraspilotum, Hope. Victoria Range.

Gonocephalum adalaidae, Blackb. Lake Lonsdale.

New Victorian record.

Docalis pilosus, n.sp. Carter.

Elongate ovate, dark brown, antennae, legs and under-side piceous red; elytra with sparse fascicles of white hair irregularly placed; the whole upper surface sparsely clad with long upright hairs, besides a denser covering of shorter bristles. Head coarsely granulose punctate, sub-truncate in front, antennal orbit straight at sides, eyes small but prominent; antennae stout, their segments

closely adapted and pilose. 1st, cup shaped; 2nd, barrel shaped; these wider than rest, 3-10; subequal; 11th, narrower, but not longer than 10.

Prothorax not wider than head; apex truncate, sides straight for the greater part, rather strongly narrowed but rounded off behind, the base forming a somewhat rounded arch; margins deflexed and serrated; the whole surface coarsely reticulate punctate, the intervals especially towards sides granulose.

Scutellum rounded.

Elytra wider than prothorax, rather strongly convex, shoulders widely rounded off, sides nearly straight behind these, rather abruptly narrowed behind with a steep apical declivity; striate-punctate, the deep striae bounded by finely raised ridges; intervals with large square subcancellate punctures, formed by raised transverse hatchments.

Legs short and strongly bristled.

Underside coarsely punctate.

Dimensions, 3 x 1mm.

Habitat.—Mt. Arapiles, Western Victoria. (Field Naturalists' expedition), per F. E. Wilson, Esq.

A single example is clearly congeneric with, but very distinct from *Docalis funerosus*, Hope, from which it differs in its much smaller size, subcylindric prothorax, doubly pilose surface (having long upright hairs besides the shorter bristles—also seen in *D. funerosus*), and a relatively coarser sculpture.

Holotype, returned to Mr. Wilson for the National Museum, Melbourne.

CISTELLIDAE.

Atbicus bicolor, Blackb. Dunkeld.

Chromomoea unicolor, Bates. Dunkeld.

PYTHIDAE.

Neosalpingus dentaticollis, Blackb. Victoria

Range. A rare insect.

ANTHICIDAE.

Anthicus cancellatus, Lea. Mt. Arapiles.

Rare.

Anthicus myrteus, King. Mt. Sturgeon.

SCARABAEIDAE.

Onthophagus mnischei, Harold. Mt. Arapiles.

Trox australasiae, Erich. Dunkeld.

Heteronyx xanthotrichus, Blackb. Mt. Arapiles.

" sp. Dunkeld.

" " Dunkeld.

" near *pubescens*, Erich. Dunkeld.

" *pustulosus*, Blackb. Dunkeld.

" sp.

Stethaspis monticola, Blackb. Mt. Arapiles.

The single example of this species taken was a male, which differs from other species of the genus in its rather remarkable antennae.

Eurychelus marmoratus, Blanch. Dunkeld.

Liparetrus nigrinus, Blackb. Dunkeld.

" ? *phoenicopterus*, Blackb. Mt. Arapiles.

" *flavipennis*, Lea. Mt. Arapiles.

Cheiroplatys maellus, Erich. Mt. Arapiles.

CERAMBYCIDAE.

Coptocerus rubripes, Boisd. Mt. Arapiles, Dunkeld.

Tessaromma undatum, Newman. Dunkeld.

Pempsamakra dispersa, Newman. Dunkeld.

Zoedia triangularis, Pasc. Dunkeld.

Darker than usual.

Eburiphora octoguttata, White. Mt. Arapiles.

Rare.

Aesiolyche favosa, Pasc. Mt. Arapiles.

Rare.

CURCULIONIDAE.

Emplesis munda, Blackb. Dunkeld.

Desiantha nosciva, Lea. Mt. Arapiles.

Notiosomus rugosipennis, Lea. Dunkeld.

? Gen. and sp. Mt. Zero.

Mr. Lea informs me that this is probably a new genus near *Phrynixus*.

HYMENOPTERA.

BELYTIDAE.

Neobetyla spinosa, Dodd.

Mr. Allan Dodd supplied me with the following notes re this species:—

“Through the courtesy of Mr. F. E. Wilson, I have had the opportunity of examining a pair of wingless *Proctotrypids*, collected in tussock grass, Mt. Arapiles, Victoria, Oct., 1927. The insects belong to the genus *Neobetyla*, Dodd, of the family, *Belytidae*, and appear identical with *Neobetyla spinosa*, Dodd. The male of this genus has not hitherto been recorded; most unusually for the family the wings in this sex are vestigial as in the female.

EURYTOMIDAE.

Eurytoma, sp. Male.

COLLETIDAE.

Paracolletes tuberculatus, Cockerell.

REFERENCES.

1. Proc. Roy. Soc., Vic., 1910, pp. 133-134.
2. Proc. Linn. Soc., N.S.W., 1906 (2), pp. 215-216.
3. Proc. Linn. Soc., N.S.W., 1886, pp. 453-454.

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THE FIELD NATURALISTS' CLUB OF VICTORIA.

The ordinary monthly meeting of the Club was held in the Royal Society's Hall, on Monday, October 8th, 1928. The President, Mr. F. E. Wilson, F.E.S., occupied the chair, and about 100 members and visitors were present.

CORRESPONDENCE.

From Mr. C. French, Senr., thanking members for their congratulations on the occasion of his 89th birthday.

From Mr. John Wilson, stating that damage to Cheltenham Park was threatened by drainage discharge in connection with sub-division of adjacent land.

From Town Planning Association, inviting the Club to appoint representatives on a deputation to the Minister of Lands on October 10th to protest against the proposed sale of portion of the Dandenong Police Paddock.

From Council for Scientific and Industrial Research, giving details of conditions in regard to grants to research workers.

The matter of Cheltenham Park was referred to the Committee for attention.

Messrs. A. E. Keep, E. E. Pescott, C. Daley, G. Coghill, C. Barrett, and the President, were appointed as representatives on the deputation to the Minister of Lands, relative to the Dandenong Police Paddock.

REPORTS.

Reports of excursions were given as follow:—Heidelberg, Mr. J. A. Wilcox; Fitzroy Gardens, Mr. V. H. Miller; Jackson's Creek and Gorge, Mr. A. L. Scott; Bayswater to Ringwood, Mr. A. E. Keep; Bendigo, Mr. C. Daley.

ELECTION OF MEMBERS.

The following were duly elected as ordinary members, on a show of hands:—Miss Edith Fankhauser, Balwyn-road, Canterbury; and Miss Ruby Shaw, Walsh-street, South Yarra.

GENERAL.

The President welcomed Mr. W. C. Hackett, of Adelaide, a member of this Club, and also the South Australian Field Naturalists' Society.

The President referred to the recent Wildflower Show, which had been very successful, and specially mentioned the valuable services of Mr. V. H. Miller in connection therewith. Mr. A. E. Keep moved that a special minute be placed on the records of the Club, thanking Mr. Miller for the splendid work performed by him in respect of the Show. Mr. F. Pitcher, in seconding the motion, spoke in appreciative terms of Mr. Miller's ability and willingness to assist in every way. The motion was carried with acclamation.

LECTURES, &c.

An interesting lecture was given by Mr. Chas. Barrett, C.M.Z.S., in which he described, with the aid of a series of lantern slides, many of the animals and plants met with on his recent visit to the Daintree River district, North Queensland.

Mr. F. G. A. Barnard read a paper by Mr. V. H. Miller, describing his quest for orchids during a recent visit to Mount Tambourine, Queensland.

EXHIBITS.

By Miss M. L. Wigan.—(a) Three specimens of Gum Emperor-Moth (*Antheraea eucalypti*), showing great variation of size, markings, and colouration, the latter being due to the food consumed by the caterpillar; one specimen, a rather unusual one, being very large and of a beautiful reddish colour. (b) Mistletoe (*Loranthus*) growing on branch of English Oak.

By Miss N. Moorehouse.—Specimens of *Tetratheca ciliata*, *Eriostemon obovatis*, *Calytrix tetragona*, *Burchardia umbellata*, and *Glossodia major*, from Bendigo.

By Mr. G. Coghill.—Specimens of *Kunzea parvifolia*, *Prostanthera nivea*, and *Grevillea rosmarinifolia*, grown at Canterbury.

By Mr. L. L. Hodgson.—Specimens of *Calytrix sublivani*, *Grevillea rosmarinifolia*, *Grevillea asplenifolia*, and *Chamaelaucium uncinatum* (Geraldton Waxflower), grown at Canterbury.

By Mr. H. P. McColl.—Specimens of *Eucalyptus torquata*, *Prostanthera nivea*, and *Hardenbergia comp-toniana*, grown at Kew.

By Mr. A. E. Rodda.—Shells and Exo-skeleton of Box-fish, from Largs Bay, South Australia.

By Mr. V. H. Miller.—Orchids from Bendigo: *Calochilus robertsoni*, *Glossodia major*, *Caladenia testacea*, and *C. congesta*; also galls of *Acacia*.

By Mr. F. G. A. Barnard.—Plants of *Xerotes longifolia*.

By Mr. T. Greaves.—(a) Cetonid beetle (*Dilochrosis frenchi*, Bl.); (b) male and female of *Phalacrognathus muelleri*, Macleay; (c) worker of *Myrmecia mjobergi*, found in nest 80 feet from ground, in an epiphyte; (d) leaf and thorny tendril of Lawyer-vine (*Calamus muelleri*); (e) large bean; (f) specimens of commercial sugar-cane: all from Kuranda, North Queensland.

BENDIGO EXCURSION.

Four members only made the trip to Bendigo, on Saturday, October 6th. We spent the afternoon rambling in the bush north-west of One-tree Hill. On Sunday morning a cursory survey was made of some physiographic and geological features; and in the afternoon a trip to the bush north-east of One-tree Hill, a distance of about five miles, was made.

Owing to the dry conditions prevailing a fortnight before, there was not the usual variety of flowers in bloom, although a week's rain had refreshed the bush wonderfully. We found the Wax-flower, *Eriostemon obovalis*, still in fine bloom; the Bitter Peas, *Daviesia corymbosa*, and *D. ulicina*, in full flower; the Rice-flower, *Pimelea spathulata*, profusely blooming, and *Grevillea lanigera* at its best. *Tetratheca ciliata* made a fine show of colour. Orchids were scarce in species; *Thelymitra aristata*, usually in thousands, having passed. Seven species were noted, among which *Glossadia major* showed countless flowers, while a few good specimens of *Calochilus Robertsonii* were also gathered. It is interesting to find *Calytrix tetragona*, a comparatively recent migrant from the Whipstick Scrub, and common to Mallee vegetation, obtaining a footing in the ranges near One-tree Hill and spreading, some fully-flowering shrubs being seen.

In a few cases the Ironbark, *Eucalyptus sideroxylon*, was somewhat unseasonably in flower. In some parts of the bush, under the welcome rains, was a veritable wild-flower garden. The Wax-flower is still being gathered for sale, in bunches, to visitors.

Birds were individually numerous, but not of many kinds. The Harmonious Shrike-thrust was calling, and the Regent Honey-eater was seen both in the bush and in Rosalind Park, evidently more numerous than usual. At one of the lakelets in the Park, at sundown, Reed-Warblers were tunelessly inter-changing experiences.

The only Acacia in bloom was *Acacia armata*. The Golden Wattle, *A. pyramantha*, the glory of the hills in September, "twixt shadow and shine," was now in pods.—CHAS. DALEY.

NOTES ON TWO GRASSHOPPER-WASPS.

BY L. G. CHANDLER.

In Red Cliffs (Vic.) there is a number of species of wasps, which prey upon grasshoppers and crickets. It is fortunate that horticulturists have these insect-friends, for bird-life yearly becomes scarcer in the district. Unchecked, the noxious insects would dominate the position, and leave ruin in their wake. Poison-sprays are of little use against a plague of grasshoppers. One might just as well attempt to stop a dust-storm in Sydney Road with a bucket of water! The use of such sprays, on a large scale, would ultimately cause the extermination of some species of our birds.

Thousands of insectivorous birds already have been poisoned: we can only guess at the number. I know that the growing scarcity of wild birds is becoming alarming, and the poison cart and poison spray are responsible for much of this loss. With the breeding haunts of birds also rapidly being destroyed, the useful insect will have to be depended upon to aid man in his fight against destructive insects, and it is well that we should know our friends.

In the majority of country homes, if a wasp of any species happened to find its way to the window, it would promptly be killed as a "beastly stinging creature." If the killer knew something of its life-history the story would, in most cases, be different. Through the same ignorance, thousands of useful creatures are destroyed annually, particularly birds, and the prosperity of our country is seriously handicapped.

In all new settlements some effort should be made by the Government to instil a knowledge of the friends and foes of the "man on the land" into the minds of new settlers. Lantern lectures are out of date, and it is time that the cinema was widely used in this connection. To take a moving picture of an insect would present difficulties, but they could be overcome by special methods.

I must admit that, even with an ordinary camera, I have found the photography of wasps very difficult. I have no photographs of the two species whose habits I propose briefly to outline; but often I have missed the opportunity to secure a photograph, in my eagerness to record some detail.

Chlorion claviger and *C. globosus* are found in this district; the former is rather a rare species, the latter, in some seasons, a common one. *C. claviger*, from my observations, confines its attention to a beautiful green grasshopper, a slim creature with long antennae. I have seen only a few specimens of this grasshopper, but the wasp has no difficulty in locating her game. *C. globosus* captures the more common types of grasshoppers or locusts, which, on summer days, add their instrumental music to the sounds of Nature.

Chlorion claviger differs, in many respects, from the paralyser of the common grasshoppers. She is no vagrant, content with a shallow burrow on the spot where she captures her prey. Her nursery is a palace beside the humble home that shelters the young of *C. globosus*. The burrow is five to six inches deep, and a number of cells radiate from the bottom. These cells are made as required, to accommodate the game. The main shaft, I believe, is excavated before the hunt begins. On each hunting trip the sloping entrance to the burrow is filled in with sand.

It is interesting to watch this wasp at the work of excavation. She works quickly, and as the grains of sand are brought to the surface in her front tarsi, she walks backwards for a distance of a few inches to several feet, and, with a jerk, throws the load behind her. Parasitical flies are savagely attacked; and, unlike some species of wasp which exhibit fear in the presence of ants, she has a system of her own to drive away the little marauders. She simply hovers above the ant, and when the latter has recovered sufficiently to escape from this miniature whirlwind, it makes off at top speed. I fancy if ants located the prey of *C. claviger*, there would be a lively battle over the booty.

On a dry, hot day, it is refreshing to witness the intense energy of this wasp. There is no "go-slow" policy with her. The confidence with which she puts undesirable insects to flight, and her healthy activities are an inspiration. I have not tested the effect of her sting, but her movements indicate that it might make one "hop." Though, truth to tell, the sting of many of these solitary wasps, causes only temporary inconvenience. It is intended for the scientific business of inflicting paralysis, and is not a defensive weapon like the sting of a bee.

As a matter of fact, with some species of wasp, I frequently stage the conflict, between wasp and prey, under a glass cover, on the palm of my hand. By this method I have been able to see the exact nerve-centres attacked, and on no occasion have I been stung.

C. claviger, having captured and paralysed her grasshopper, clasps it beneath her body, and flies to her burrow. Leaving the prey on the ground, a few yards away, she goes to the burrow and opens it. Then, if the cell below is not fully stocked, she places the grasshopper over the burrow-entrance, and goes below for an inspection. Ascending, she grasps the paralysed creature and drags it out of sight. Should the last cell be stocked, she excavates another before taking the grasshopper underground, and the work is quickly done.

I made several attempts to dig out burrows, but failed until I thought of a sure plan. A grass stem is inserted in the burrow, as a guide, and then the ground is dug away to a radius of from 18 inches to two feet from this centre, leaving the entrance to the shaft at the top of a pyramid. The pyramid is gradually reduced by a clasp-knife until the cells are reached. By this means, very little earth falls down the shaft.

When I successfully opened the first burrow of *C. claviger*, the sight that met my delighted eyes was well worth the hard work under a scorching sun. Three lateral cells radiated from the bottom of the burrow to a distance of about two inches each. One cell contained three grasshoppers tucked in side by side; the second, one grasshopper, and the third a well-developed grub, and the remnants of a feast. Lying there, in the brilliant sunshine, these dainty grasshoppers resembled tiny, green fishes, or miniature ornaments cut from delicately-tinted jade.*

The egg of this wasp is fastened to the thorax between the first pair of legs. It is curved, and about $5/32$ of an inch in length.

Chlorion globosus is a smaller wasp than his relative, *C. claviger*. On a warm summer day, when hordes of grasshoppers are a-wing—most of them advancing in the same direction—she has no difficulty in finding her prey. Running about until a grasshopper rises in front or flies

*It is possible that this particular species of grasshopper may be semi-insectivorous, but I know nothing about its habits.

overhead, like a flash she is in pursuit. Turn and twist as it may, the hopper cannot evade that tenacious pursuer; and wasp and game come to earth almost together. If the wasp is slow in coming to grips, the grasshopper might escape temporarily, but the relentless foe is quickly after it.

Sometimes, particularly when the hoppers are plentiful, the pursued one escapes. Among a number of flying forms, the wasp is confused and continues the chase after a different individual. The least hesitation on the part of the grasshopper when it alights, results in its capture. The Chlorion grasps its closed wings with her mandibles, and mounts its back—head to abdomen. Instead of plunging and jumping, as one might expect, the creature feebly attempts to ward off the blow from the sting by pushing forward with the basal portion of its jumping legs. The struggle sometimes continues for several minutes, and finally the wasp slips under the guard, or deliberately changes the assault to the opposite side, and the hopper is stung in the nerve-centre between the first pair of legs. This sting apparently paralyses the front pair of legs, and on disturbing the wasp at this stage, I have seen her prey hop into the air and fly away.

The second point attacked is the base of the second left or right leg, according to the advantage of the moment. The victim is now helpless, for the last place stung paralyses the jumping legs, and as the creature cannot hop into the air, its sails are useless. The gap between head and thorax is now forced open, and the wasp inserts her tongue. She must obtain nourishment by this action, for she continues the sucking for several minutes. Numerous species of wasps extract juices from their victims, but usually from the mouth. One wonders if they ever, on occasion, hunt solely for the purpose of refreshment. Faber certainly thought so in the case of a *Philanthus*—a bee-catcher.

In all the cases that have come under my notice, the instinct for the future of the race is strong, and the lapping of juices from the game is only a part of a sequence of actions. Indeed, who can say that it is not a very necessary part? It may be essential for the welfare of the wasp-grub that these juices be removed.

The paralysed grasshopper is left where it was captured, or carried a short distance and deposited in the open or on herbage a few inches off the ground. The wasp is not robust enough to fly with her game, so she

transports it by placing herself astride the body. The antennae she grasps in her mandibles, and the body is clasped with her front legs. She leaves the hopper close to the spot where the burrow will be dug, and she frequently visits and moves it a short distance, and nearer to her work, when engaged on the excavation. Soil that is firm enough to dig into, without a possibility of the walls collapsing, is suitable for her purpose.

The burrow is perpendicular, and about one and a half inches in depth, and a cell to contain the single head of game runs off at an angle at the bottom. Such a shallow shaft is quickly dug, and the shaft and cell to receive the grasshopper are ready within fifteen minutes to half-an-hour. Some wasps work feverishly; others linger over the job, and take spells for the purpose of grooming and sunning themselves.

When the cell is ready, she carries the hopper to the entrance, and, like *C. claviger*, goes below for a final inspection, comes up again, and hauls the creature below. A number of species of wasps never omit this last inspection of the burrow, and the observer may remove the game again and again, and they still persist. It is a curious action, and difficult to account for. It may be that the wasps are afraid of some enemy, or it is merely a final measurement, or perhaps done to give the last touches to the cell.

The egg is laid on the body at the base of either of the jumping legs. Within thirty seconds, as a rule, the wasp is on the surface, and at once begins to fill in the burrow. At intervals a small quantity of earth is scratched backwards with her fore feet into the hole, and pushed into position with her head.

After scratching the soil for several inches around the filled-in burrow, the wasp scatters a few small sticks and pebbles over the spot, and in eight or ten minutes all traces of the grasshopper's tomb has disappeared. In a few days the egg within will develop into a grub, and when the banquet of living flesh is finished the grub will pupate, and, in the course of time, emerge as a perfect insect. The industrious mother troubles no further about that particular offspring. While the wonderful transformation from egg to adult insect is taking place in that tiny cell, she has, unconcernedly, been capturing and paralysing more grasshoppers, digging burrows for their reception, and seemingly unconsciously making the future welfare of her race assured.

The obvious anxiety of *C. globosus* for the safety of her paralysed prey, seems to show that she knows that enemies surround her. Chief among these are ants, parasitical flies, birds and lizards. I was, on one occasion, following a wasp with her grasshopper, when a bearded dragon made a rush at her. She had just time to drop her booty and escape. The lizard gulped down the dainty tit-bit, and, with a quaint waddle, returned to the shade of the verandah. His unexpected attack, although it created an amusing diversion, quite upset a plan that I was formulating.

Ants often cluster thickly upon the prey of the wasp, and after a few ineffective attempts to dislodge them, she leaves. If only a few ants are present, she succeeds sometimes, in retaining her prize. Should an ant wander into her partly excavated burrow, she will frequently abandon it, and begin upon another a few feet away.

Strange to say, although parasitical flies appear to annoy her by their presence, should one drop its larvae or eggs down the burrow, when she is engaged in laying an egg upon her grasshopper, the wasp, apparently, takes no notice of them, and the burrow is filled in with the parasites in the cell. As a result, the rations will be consumed, and her offspring destroyed.

Chlorion globosus is a smaller wasp than her relative, a check on the common grasshoppers or locusts. As stated previously, the green grasshopper of *C. claviger* may be semi-insectivorous. In any case, *C. claviger*, in this district at least, is a comparatively rare species, and therefore cannot be considered as an important economic factor.

EXCURSION TO BORONIA.

More than 30 members and friends attended this excursion. The weather was showery, but a pleasant three hours were spent in the bush. It was somewhat early in the year to see Boronia at its best, botanically; but we found a good deal to interest us. Almost 100 flowering plants (47 in flower) and ferns were recognised. Most conspicuous were the Acacias. Nine species native to the district, besides several others in cultivation, were seen in full flower. *Acacia myrtifolia* was specially fine.

We were not very fortunate with orchids. Five species only were found in flower, including *Caladenia Patersonii*, *C. praecox*, and *Acianthus caudatus*. Perhaps the most remarkable find was *Helichrysum obcordatum*, rather a rarity in this part of the country. *Fullenaea subumbellata* and *Epacris microphylla* were other notable plants seen in flower. A visit to the Boronia flower farm was intended, but time was lacking to complete this part of the programme. We were able to admire the flowery fields from the roadway,—DAVID J. PATON.

THE WILD-FLOWER SHOW, 1928.

This pleasing function in the Club's activities was held on Tuesday, October 2nd, at the St. Kilda Town Hall. At 3 p.m., the President, Mr. F. E. Wilson, F.E.S., introduced Miss Irene Vanbrugh, who formally opened the Show, and expressed her pleasure at being present, and her delight in Australian wild-flowers, posies of which were presented to her and to the Mayoress of St. Kilda, also present. Among the many interested visitors was Mr. Chas. French, Senr., foundation member of the Club.

As usual, the Show attracted a large attendance, the varied display was representative of every State except Tasmania; flowers from New South Wales and Western Australia being greatly admired. Among special district displays, that of Tyers, near Traralgon, by Miss J. Galbraith, alike in its diversity of 150 species, and its attractiveness, was very fine. The Mallee district was fairly represented. Mr. G. Coghill had a good collection from Taradale; and the richness and beauty of the Gram-pains flora were evident in the collection of Messrs. J. W. Audas and F. D'Alton, also Mr. Hill, of Stawell.

Mr. H. Smith, of Horsham, showed a good collection from Mt. Byron. Mr. L. G. Chandler, of Red Cliffs, sent an interesting exhibit, the *Cassias*, "Ham-and Eggs" Daisies, and *Comb-Grevillea* being very fine. The Gippsland display, effective and extensive, also included cultivated plants grown by the Misses Currie, Lardner; Mr. Staughton sent a small, but attractive selection of Queensland plants; Mr. Bennett, of Bargo, N.S.W., an excellent exhibit from that State; Mr. Ising, for the Field Naturalists' Society, Adelaide, flowers from South Australia, and Mr. Myers, a characteristic collection of West Australian plants. A special display of an educative nature was well staged by the Director and students of the Burnley Horticultural Gardens, while Mr. Smith, Curator of Metropolitan Parks and Gardens, kindly made available Australian plants in pots for the stage, among which the Geraldton Wax-flower was very striking.

A specimen of a plant collected by Banks and Solander, of Captain Cook's famous expedition, was shown, in juxtaposition with a well-executed model of "The Endeavour," in full sail, by Mr. H. P. Dickens. A varied and pleasing collection of Australian flowers under cultivation was supplied by Messrs. F. Keep, G. Coghill, and L. L. Hodgson.

The following ladies were in busy attendance on the different stalls, which made up one of the most effective shows yet held by the Club: Victoria, Mesdames Edmonson and Hardy, and Miss Nokes; Grampians, Mesdames Pescott, Barrett, Sutherland; Mallee, the Misses Hart; New South Wales, Mesdames Pitcher and Daley; West Australia, Mrs. Miller and Miss Fuller; Orchids, Mrs. and Miss Coleman; Pot Plants, Mesdames Pitcher, Daley, and Robertson, and the Misses Hughes and Greeves. At the useful and informative classification table, 250 species of plants were staged by Mr. H. B. Williamson, F.L.S., assisted by Miss J. Galbraith. In a room off the main hall, Miss J. W. Raff had arranged a most instructive microscopical exhibition, illustrative in general of botanical science, pond life, geology, etc. Miss Raff was assisted by Messrs. A. E. Rodda, W. H. Ferguson, and other members of the Club. Members of the Microscopical Society tabled exhibits; and others came from the University Botanical Department, the Emily McPherson School of Domestic Economy, and the Teachers' Training College. Mr. P. R. H. St. John kindly hand-printed descriptive subject cards, and Mr. J. Searle gave valuable help in the making of the display.

In an adjoining room, Mr. Charles Gabriel presided over the section for Natural History exhibits, of which Mr. Gabriel's excellent collection of shells, and an unique ethnological exhibit by Mr. W. Gill attracted much attention. Miss A. Fuller's admirable paintings of Australian and South African wild-flowers were also on view. An Information Bureau, which was well used, and a sale of publications, were conducted by Mr. Chas. Daley, B.A. Miss H. Gabriel, with a willing contingent of helpers, attended to the Refreshment Rooms.

The following, among others, were contributors of flowers, etc., to the Show:—Mr. F. Barton, Jr., Paynesville; Mrs. Brookes, Maldon; the Misses Currie, Lardner; Miss Connell, Bendigo; Mr. Allister Clarke, Melbourne; Mr. J. A. Dower, Moe; Miss Dyall, Garfield; Mr. F. W. Dyall, Drouin; Mr. Dorman, Taradale; Mr. J. Davidson, Chiltern; Mrs. M. Evans, Lima East; Mrs. W. W. Eskdale, Bendigo; Mr. J. B. Hodgson, Hedley; Mr. George Higgins, Red Hill; Mr. J. Hill, Stawell; Mr. T. S. Hart, Bairnsdale; Mr. A. Ladson, Beechworth; Mr. C. J. Mann, Bailiestown; Mr. Opperman, Eltham; Mr. A. J. Pitcher, Bright; Miss E. Ryall, Yarra Junction; Misses

E. and L. Rossiter, Hedley; Rosebud State School; Mrs. Stafford, Lima E.; Mr. H. G. Williams, Lima E. Messrs. E. Keep, A. Vroland, H. E. James, F. Keep, A. S. Blake. Misses G. Nokes and N. Moorehouse contributed flowers from districts near Melbourne.

The Orchid Section, as usual, was a centre of interest. Contributors to it, not previously mentioned, were:—Mrs. Chadwick, Rosebud; Mrs. Clarkson, Black Rock; Miss Lyle, Yarra Junction; Miss Rich, Rushworth; Miss Millard, Girls' Grammar School, Ivanhoe; Messrs. F. E. Wilson, Paton, V. Miller, M. A. Graham, Misses Hart and Bolton, and Mrs. C. Barrett lent cultivated specimens, growing and in flower. The total number of species of Orchids making the fine representative display, was 63. This list includes five interesting Western Australian species (sent by correspondents), namely, *Drakaea elastica*, *D. glyptodon*, *Pterostylis turfosa*, *P. recurva*, *Caladenia filamentosa*, and *C. Patersonii*, variety *longicauda*; also fine specimens of *Sarcophilus falcatus*, *S. montanus* and *S. olivaceus*, lent by members of the Club.

Mention may be made of the great advance shown in the cultivation of indigenous plants by florists and others, a large number of attractive species being now procurable. Business in the sale of pot plants purchased or donated was brisk, and shows the demand for native plants for garden cultivation. Another feature was the keen and increasing interest of young people in the practical study of Botany.

Altogether the Committee and members generally have cause for congratulation in the success of the Wild-flower Show for 1928.—C.D.

ETHNOLOGICAL SECTION.

The monthly meeting of the Section was held on October 9th, by invitation, at Dr. Sydney Pern's residence, Toorak. Opportunity was taken to inspect his very fine and varied collection of ethnological objects from Australia, South Africa, Polynesia, etc., including some which, on account of rarity, method of construction, or unusual incident attached thereto, were of special interest.

Dr. Pern's lucid and informative comments upon certain groups were much appreciated. A fine collection of snake-skins from African and Australian species served as a basis for discussion on the Ophidia.

At the next meeting at 8 p.m. on Tuesday, November 20th, at Latham House, Mr. J. A. Kershaw will give a paper on "Swiss Lake-dwellings." All members of the Field Naturalists' Club are invited to attend.

LETTERS FROM DARWIN AND OWEN.

BY CHAS. DALEY, B.A., F.L.S.

In the year 1851, James Stewart Dismorr, of St. Kilda, a young man with a liking for natural history, took the opportunity, while on a visit to England, of submitting to Charles Darwin some specimens which he thought were "fossil footsteps." In reply, Darwin wrote the following letter to him:—

Down, Farnborough, Kent,

May 6.

Dear Sir,—

I am very much obliged to you for informing me of your interesting discovery of fossil footsteps near Port Philip (sic) in Australia; the first observed in the southern hemisphere, and the more interesting from the possibility of the formation being palaeozoic. Circumstances will prevent my coming to town for a considerable time, otherwise I should have much liked to have seen your specimens.

Professor Owen, of the R. College of Surgeons, Lincoln Inn Fields, the highest authority in the world in Zoology, has lately been attending to the subject, and I feel sure, would be very glad to examine the footsteps, if you would take the trouble to send or take your specimens there; and this note would serve as an introduction to him, and I am sure he would be pleased to give you all the information in his power on your interesting specimen. Mr. Jukes, of the Museum of Economic Geology, is the most likely man to know whatever little is known of the Geology of Port Philip. I am extremely glad to hear that you will yourself, on your return, attend to this information, and I hope that you may be enabled to send home some fossil shells from some overlying bed.

Dear Sir,

Yours faithfully,

C. DARWIN.

Mr. Dismorr evidently submitted specimens to Professor Owen, and the result of his determination is referred to in a second letter from Charles Darwin:—

J. S. Dismorr, Esq.

Down, Farnborough, Kent,

May 15.

Dear Sir,—

I have received your two notes and the box; I am very sorry that you have had all this trouble in vain, but I trust it will not damp your geological zeal. Depend on it, everyone makes plenty of blunders at first, and I well know that I have done so, and so long that they are not printed and published, it signifies nothing. I have seen concretionary bodies something like those sent; there is often a tendency in iron concretions to form hollow spheres, and your bodies are, to a certain extent, a much modified ironstone of this same tendency.

Allow me to suggest to you not to be in a hurry in sending off any fossils, which you may collect, as your specimens will be use-

ful to you for comparison in case you find any second lot: but anything which you may wish to send home I will willingly do my best with, and place in the hands of those best qualified to appreciate them and describe them.

I sincerely hope that you may meet with success, and find interest in your geological pursuits. If you have not procured the Admiralty Manual of Scientific Enquiry, and would like to possess a copy, I have a spare one, and shd. have pleasure in sending it to you in a few days from the Dilic. Company.

You have indeed been most scrupulous in not putting me to any charge, and as you would perhaps dislike my returning you the stamp, I have cut off 12, the amount of the postage from Farnborough, for which I am much obliged.

Believe me, dear Sir,

With every good wish,

Yours very faithfully,

C. DARWIN.

One cannot but be struck with the tactful encouragement and kind consideration conveyed by the writer to the young naturalist in this letter.

Mr. Dismorr returned to Australia; and arising out of the incident referred to, evidently kept in communication with Professor Owen, who, with the following letter, supplemented a formal acknowledgment of the receipt of specimens of *Ornithorhynchus* by the Secretary of the Royal College of Surgeons:—

Rt. College of Surgeons, London, June, 5th, 1853.

My Dear Sir,—

The box with the jar containing the female *Ornithorhynchus*, killed 10th November, the pubic bones and parts of generation of a female, killed 2nd February; and the hinder parts of the body of a male, safely arrived through Mr. Hainey's care, this day, and I have just completed a careful scrutiny of the parts. First, let me thank you, which I do most heartily, for your very kind recollection of my wishes, and the handsome installment (sic.) of your zealous design in fulfilling them. Since I last had the pleasure to converse with you on the subject, I have received no specimens which advanced the knowledge of the mode of development of the *Ornithorhynchus*, beyond the point at that time reached.

The young female, killed Nov. 10th, seemed to be a virgin specimen. I have most hopes from specimens of full-grown females, killed in December and January, and I shall be glad to have the entire specimens. Those which you sent came in a pretty good state of preservation; but they would have been better had the spirit been changed just before sending off. If you will draw upon me for the expenses of obtaining and preserving future specimens, my obligation will be equally great for your kind care and interest in obtaining them. A small brandy-keg full of *Platypt* killed at any season would be acceptable to

Yours, my dear Sir,

Most truly and obliged,

RICHD. OWEN.

It is evident that, as a result of meeting Professor Owen, and of a discussion on the subject, Mr. Dismorr had procured and sent some specimens of the *Platypus* to assist the Professor in the elucidation of the question of the gestation of the animal. Mr. Dismorr continued his good offices, and a second letter, acknowledging the obligation, was received from the Professor.

J. Stewart Dismorr.

British Museum, London,
June 17th, 1856.

My Dear Sir,—

I have to acknowledge the receipt of three *Platypi*, which you have been so kind as to transmit to me. They arrived safe and in good condition. . . .

At any rate, we get additional evidence that November or December are somewhere about the breeding season, supposing, as is most probable, that season to be a regular one for the species. . . . I think the case, as it is, worthy of communicating to the Royal Society in a note in which I shall acknowledge your valuable co-operation in this matter. Your mode of preserving will answer. I believe the best chance will be to send all the females you can get, and please to direct the next keg or jar to me at the *British Museum*, where I now preside over all the Natural History.

Sincerely yours,

RICHD. OWEN.

A few years ago, in response to a request published in leading newspapers in Great Britain from the Historical Society of Victoria, and asking for the loan of letters or diaries dealing with the early colonial days, quite a number of communications was received enclosing such matter. Among these Dr. H. Dismorr, of Folkstone, England, who was born at St. Kilda, Vic., wrote, speaking of his father's interest in geology and zoology, and of his correspondence with Darwin and Professor Owen. He sent copies of the letters here, re-produced, and mentioned that others had been written, and additional jars of *Platypi* had been sent by his father to Professor Owen.

From the various letters and diaries sent from Britain to the Historical Society, a careful selection was made by Mr. A. W. Greig. A series of articles was read before the Society, and then published as a Special Pioneer Number in its Magazine (Vol. XII., No. 2, December, 1927), a copy of which was sent to all overseas contributors, among them Dr. Dismoor. The Doctor, in acknowledging the receipt of the copy, forwarded the four original letters of the eminent scientists as a gift to the Historical Society.

LIFE HISTORIES OF SOME VICTORIAN
LYCAENIDS.

BY C. BÖRCH.

The butterflies that I propose to deal with in this paper, namely, the Moonlight Blue, *Miletus delicia d'elos*, the Mistletoe Blue, *Ogyris olane*, the Scarce Mistletoe Blue, *Ogyris abrota*, and the Imperial Blue, *Ialmenus evagoras*, all belong to the family Lycaenidae, which, in Australia, contains about 140 species.

An interesting habit in connection with Lycaenidae is that, in the early stages of their development, they are attended by ants—some exceptions to this rule are known. Each species of butterfly seems to have a particular species of attendant ant. One of the best methods of finding larvae and pupae of many of these butterflies is to search ants' nests, in, or near, the known food plant of the species. In their appearance and habits, the attendant ants vary as much as do their charges. Some of them are very tiny, and of quiet, inoffensive habits, while others, such as that species associated with *Protialmenus iclinus*, one of the beautiful tailed-Blues, is large and ferocious—the "meat-ant," *Iridomyrmex detectus*.

Some species of Blues are gregarious, being found in such numbers as almost to destroy the food plant, while others are found singly, or in twos and threes.

The Moonlight Blue is justly regarded as the most beautiful Victorian butterfly. The genus *Miletus*, is a large one, and confined to Australia, New Guinea, and some of the adjacent islands. Most species of *Miletus* are brilliantly colored, and have their upper wing surfaces brilliantly metallic, and the lower ones with metallic lines and curved patterns. *Miletus delicia* is the finest and largest of our three Victorian species. In the male, there is a large area of scintillating silver green, margined with black, while in the female the colour is changed to silver blue. This insect is on the wing during November and December. My earliest record of appearance is November 24. Yet one emerged as late as January 1 (1927). Only one brood is hatched during the year.

Eggs of this Blue are laid in the trunks of Black Wattles, *Acacia decurrens*, and always in a tree containing a nest of a small black ant. This ant lives in tun-

nels, made by the boring larvae of large moths and beetles, in the tree trunk, or under partially loosened pieces of bark. It is at the entrance to the homes of these ants that the female butterfly deposits her eggs. As many as 20 or more eggs may be placed upon the same tree, but probably these are laid by more than one female, as the caterpillars are often of different sizes. The larvae hatch out about January, and from that month until they pupate, during October and November, they are constantly watched over by the ants. The tiny caterpillars keep out of sight during daylight, lurking under pieces of bark or in the ant tunnels, and emerge at night-time for feeding purposes. By March, they have grown to about a quarter of an inch in length, are of a greyish color; in shape, flattish and sluglike, and are clothed with a few short, scattered hairs.

This is an opportune time to hunt for larvae, as the cold has not yet driven them deep into the recesses of the ants' nests. With the advent of colder nights, they penetrate deep into the nests, and emerge to feed only during warmer spells. For some months now, very little growth is apparent; in fact, it may almost be said that they hibernate, but July sees them on the move again, and, on warm nights, they ascend the trees to feed on the foliage. Two or three ants always appear to accompany the caterpillar on its foraging expedition, swarming and clinging to its back, and returning with it. During the first and second weeks of August, the larval skin is cast for the first moult, and from this time until pupating, growth is rapid. Before casting the skin, larvae are of a dark slaty grey colour, with skin tight and stretched, but immediately after, the colour has a whitish, transparent appearance, with the skin loose and free.

In 1926, I observed the first sign of pupation on October 7, when some of the larvae had fastened together two pieces of wattle bark by means of several silken threads. The interior of the bark had been partially covered with this thread, spun round and round the spot intended for use during the pupal stage. On October 10, the first one attached itself for pupation by means of a silken girdle round the waist, and its two tail claspers. It remained quiet until October 17, when it had assumed a more rounded appearance, and had changed color from a dark grey to a light brown. On the 17th, pupation was complete, and the butterfly emerged

November 24, showing the pupation period as having been thirty-eight days. The only localities in which I know of this butterfly having been taken are Springvale, Launching Place, and Woori Yallock.

A characteristic of all the *Miletus* is, that they are very local and are seldom taken far from their haunts, but they may be obtained, year after year, in the same place, and, indeed, in the same tree. It has been claimed that the larvae could not live without the company of the ants; but the late Mr. W. H. Rogers proved this to be incorrect. He kept a caterpillar from March until it pupated, about seven months later, without the attention of even one ant.

Miletus larvae appear to suffer very little from attacks of the small parasitic ichneumon fly, and I have only on one occasion, bred out an ichneumon. Indeed, the ants seem to form a very efficient protection against many of the enemies from which unprotected species suffer most heavily. The association is of mutual benefit, however, for the ants obtain food in the form of a sweet substance exuded from a gland towards the anal end of the larva. This is much relished by the ants.

Ogyris olane is also a member of a large genus, confined to Australia, with the exception of one species, *Ogyris meeki*, which is found in New Guinea. They are all strong, robust insects. Some are extremely beautiful, with brilliant satiny blues or deep velvet blues, contrasted with cream and black markings. All are mistletoe feeders, though the *Loranthus* selected by different *Ogyris*, is of various species. In one of the largest forms, *O. zozini*, an interesting peculiarity noticed in the females is that they assume two distinct colours, with no intermediate forms. In one form, the central wing areas are metallic blue, in the other, distinctly purple. Appropriate popular names are given to some of these *Ogyris*, such as the "Cooktown Beauty" for *O. aenone*, and the "Satin Blue" for *O. umaryllis*.

The Mistletoe Blue is one of the few *Lycaenids* not attended by ants, for it has no secretory gland, yet very often I have taken it very near, or in association with, ants. It is a moderate-sized butterfly, with wings edged with black, and with bluish purple central areas. The female is larger and of a brighter blue, and is an exception in that she is more showy than the male. Butterflies are on the wing right through each month from September to April—my earliest record being September 3. Two main broods, however, emerge—in November, and

in February and March. In the first brood, males predominate; in the second, females. Eggs are laid, on the clumps of *Loranthus*, in ones or twos, usually on the stems or leaves. The small larvae frequently hide close up to the mistletoe, under loose bark, etc., only venturing out for food at night-time. As they grow, they wander further and further away from their food plant, and often, when searching the butts of the host tree, I have found caterpillars 40 or 50 feet from the nearest food plant. This journey must be made twice during each night, to obtain meals.

The caterpillars of this species are of an oval, rather flattened shape, with segments well defined, and are of a dirty yellow-brown colour. They are rather naked, and only taken singly or in pairs. I am not aware of the time occupied in the larval stage; it is probably eight or nine weeks. When ready, the insect attaches itself to the underside of a piece of bark by means of the waist girdle, and to a piece of web by the tail. The pupating period varies considerably, and is influenced by the weather. In the cold months, the pupal stage extends over fourteen or sixteen weeks; and yet I have a record of only 33 days—from November 16 to December 19. This is a common insect, and I have taken it in many localities in Victoria, including Ringwood, Eltham, You Yangs, Lilydale, Ballarat, and Bendigo. The larvae of this butterfly are much more parasitized than those of the previous species, for they lack the ant protection.

Ogyris abrotæ, the Scarce Mistletoe Blue, is much rarer than *O. olane*, and is much larger than that species. The male, with rich, dark purple wings, bordered with a narrow black band, is an exquisite insect. The female is so distinct that she has been described as a different species. Her forewing is brown-black, with a large central cream area. Her eggs are deposited in the same position as are those of *O. olane*, except that she selects a different species of mistletoe. The larvae are always attended by numbers of ants, and never appear to wander far from the mistletoe. Thus, if you see the food plant of *O. abrotæ* 40 feet up in a eucalypt, you must climb 40 feet, and search the bark close to the mistletoe, else obtain no pupae.

I remember this habit of the butterflies getting me into trouble one day. Out at Mordialloc with a friend, I saw large masses of food plant high up. A butterfly leisurely examining clump after clump of mistletoe decided me to climb, as a careful search round the butt had revealed

nothing. Temptation overcame my fear, and I crawled further and further out, examining a large limb as I went, until, finally, I found myself unable to ascend or descend, or move backwards or forwards along the bough. A most uncomfortable five minutes ensued, until my companion came to my rescue with a borrowed ladder.

Two broods appear on the wing, one in October and November, and the other in March. I have bred out odd specimens late in April. Larvae are very difficult to distinguish from those of *O. olane*, but those of *olane* have a small black patch on the back, absent from the *obrota*. The only localities at which I have taken this species are Springvale, Ringwood, You Yangs, Broadmeadows, and Mordialloc.

The last of our four Blues, *Ialmenus evagoras*, is a particularly interesting insect. It is found in Victoria, and right through to Southern Queensland. An elegant insect, it has large wing areas of pale metallic blue, bordered with black. A conspicuous tail projecting from each hind wing, gives it a distinctive appearance as a cabinet specimen. It is a truly gregarious insect, and seems to favor the small stunted specimens of its food-plant, the Black Wattle. I have seen trees completely denuded of foliage, and dying, from the activities of the larvae.

The butterflies are on the wing from November till April, and may be seen in numbers, flying about their food trees. The females seem disinclined to leave the immediate vicinity of their food-trees, and lay their eggs in clusters on stems, under leaves, or on a fork where a limb joins the main trunk. Every stage of the life history may be observed from the egg to the pupa, and the imago breaking through the pupal skin.

The larvae are of a shining, blackish colour, with segments well defined; and are constantly covered with a swarming mass of black ants. The progress of a larva along a twig always amuses me, each wave of the caterpillar's body, as it progresses, exhibiting a heaving mass of seething ant life. Obtaining pupae or larvae is likely to be quite an unpleasant operation, as the moment one touches or vibrates the tree, ants rush all over the twigs and leaves, and do not hesitate to inflict a painful little bite. I have found the best way is to pluck the twig off quickly, and drop it on the ground nearby. When a number of the ants have left it, the twig may be again

moved, and in this way, after three or four moves, it is moderately free from ants, and may be handled with some degree of comfort.

The larvae of *I. evagoras* have a habit of dropping a thread as they move, and in time, this covers most of the larger stems with a fine silken covering. Quite a web is formed at the most populous centres, and when the larvae are fully grown, that is, when they are about one inch long, they affix themselves to this web, usually clustered round one of the stems. Sometimes twenty or more pupate in a cluster. Pupae are of a nitid brown-black color, and are always covered with numerous ants. The pupal period is short, being only about fourteen days.

This species is widely distributed in Victoria, some records that I have being Eltham, Woori Yallock, Ballarat, and Daylesford.

MORNINGTON PENINSULA.

Mr. A. S. Kenyon contributes the following notes, to add to Mr. Keble's paper on the Mornington Peninsula, in the October "Naturalist."

Settlement was complete, and the whole Peninsula occupied by 1838. Yaen Yaen is not new, but is a portion of the name Bang-yanyan, later degraded officially to Bunguyan. Sandstone Island, known as Woor-a-blah, was the seat of many experiments by the Acclimatisation Society; pheasants, skylarks and thrushes were liberated there. Balnarring, originally Bullalnarrin, was a Post Office, not a run. Manton's Creek was the original run name for Meremendiewokewoke. Manton had Tooradin also. The Tucks were late comers, not arriving until 1846.

Balla Balla was first taken up by Robert Innes Allen, 1840, but abandoned shortly after. Moorooduc and Morradoo are descriptive, meaning flat, swampy. Ballarong, variously spelt Ballanrong, Ballamrong, Ballannrong, Ballyrangue, Bullerangan, Billerangue, Bellerangue and Ballanarong, was, after Jamiesons, the earliest run along with Coolart, which is a very recent spelling, Coolort, Collert, Coolert and Coolurt being the original varieties. Merricks should be Meyricks; Boneo is an older name than Boniyong; Boneo is the Swamp, Boniyong the grazing land north of it. Dr. Barker took up Boneo and Barrabang at the same time. Chechingurk was originally Tichingorouke.

ALBINO KOALA.

A pure white Koala, with blue eyes, must be a rarity. The very fine specimen figured here was obtained, when quite young, on the Rosedale Road, about five years ago. Since then it has lived on a dead branch fixed in the ground of the yard of the Woodside Hotel, at Woodside, near Yarram. Its owner, Mrs. Henderson, who has a special permit allowing her to keep it, states that soon after it was obtained, it gave birth to a grey "joey." It lives mainly on Eucalyptus leaves, but is said to be very partial to the foliage of the swamp paper-bark, so abundant in the locality. As far as is known, it has never drunk water or any other liquid, only once going to the length of smelling the former on a particularly hot day.

NOTABLE NATURALISTS.

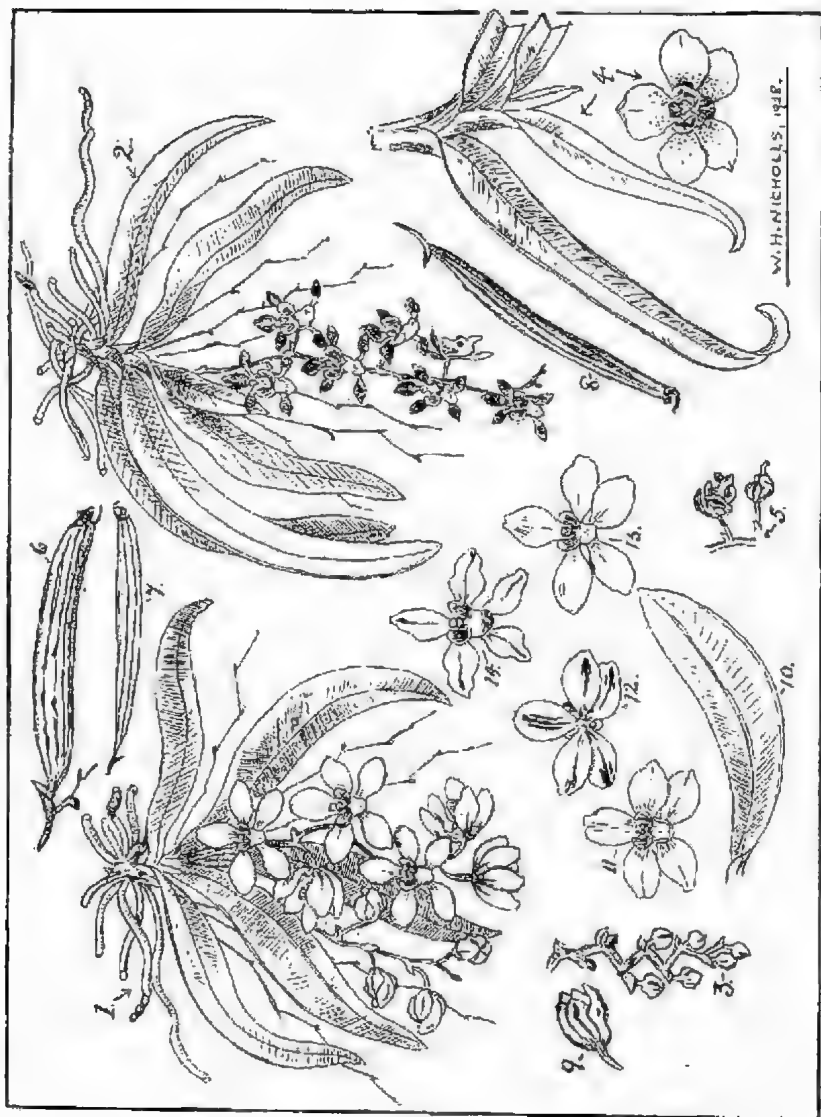
JULIAN TENISON WOODS.

Australia has known few men so distinguished as the Rev. Julian Tenison Woods, a Londoner, who came to our country early in life, his first experience being in Tasmania. Nearly all his time, from his 33rd year to his death, in his 57th, was spent on the mainland. He published some books, and many articles and papers, dealing with subjects of Australian interest; but such things are often out of print, and such has been the fate of most, or all, of Father Woods' printed work.

"Geological Observations in South Australia," the Tenison Wood book most widely known, probably, is not only a thoroughly scientific piece of writing, it is also very pleasant to read. His "History of Discovery and Exploration in Australia" is one of the best summaries of a big and interesting subject that have appeared, and it is a pity that it should be comparatively forgotten, while some works of lesser merit are read still. Then there is his treatise on "Fish and Fisheries of New South Wales," which won him a gold medal from the King of the Netherlands, and makes one fancy that he had never interested himself in any subject but fish. He was, in fact, a first-class scientist in two or three different departments, a member of a dozen learned societies, twice president of one—the Linnaean of N.S.W.—and a correspondent of their leading members—such men as Baron von Mueller.

It may then seem strange that no one should have attempted, so far, to write the life of a man so outstanding. The explanation is, possibly, a curious one, and a further evidence that the biography is needed. Julian Woods' abilities and activities were so varied, and the materials for his life so multifarious, that an intending biographer was likely to feel non-plussed, and—if he made the attempt—out of his depth. This scientist was also a fearless explorer and observer, a zealous missionary preacher, a founder of religious institutes, and a dreamer. Thousands of persons sought his spiritual direction, and the nuns of the Institute of St. Joseph (now spread from Australia to New Zealand and Ireland) acknowledge him as their father and founder.

Plate VI.



Sarcochilus falcatus, and *S. f. montanus*, and *S. parviflorus*.

For key, see p. 199.

So complex a personage, one may suppose, has hardly ever occupied the pen of a biographer. The task has been undertaken by the Rev. George O'Neill, who is a priest, as Father Woods was, and who has been a professor in two Universities and has published various historical and literary works.

THE LARVAE OF MICRODON.

Oddities abound in the Order Diptera, with its vast number of species, but none of the known forms is more remarkable perhaps, than the larvae of *Microdon*, a genus of Syrphid flies. More than a century ago, the larvae of some species were known to naturalists; but, originally, were mistaken for, and described as, molluscs, in the genus called *Parmula*. Later on, still regarded as molluscan, they were described as *Scutelligera*. It was not until 1840 that their true nature was discovered.

At a recent meeting of the Entomological Society of Queensland, Mr. G. Hardy exhibited a collection of seven described species of *Microdon*, mentioned the early mistaken ideas as to the nature of the larvae, and gave notes on the habits of the insects.

Many species, it was stated, are commonly found, in the larval form, under the bark of trees, and have been so found in New South Wales. Others occur in ant-nests away from trees, well down beneath stones. Mr. Hardy has found them in such circumstances, and he also suspects that they harbour in ant-nests in or around fallen logs, as he has frequently taken the adult around such places.

In Europe (the report of the Society's meeting states) the adults are recorded as occurring in humid meadows, flying in the grass with a humming noise; but although invariably associated with damp places in Australia, here they are noiseless. In Tasmania, they are frequently found in groups resting on twigs six or eight feet above ground. In Tasmania, the commoner species

In examining ant-nests on several occasions I have found *Microdon* larvae, right among the ants, but, apparently ignored by those insects. From a nest of *Phyracaces senescens*, in the You Yangs, I took two specimens of these curious larvae, hoping to breed out Syrphid flies, of a new species, and, more desirable, learn something of the habits of the little, creamy-white, crinkle-skinned creatures.

Ants from the nests were brought home, too; and placed in a box with the fly-larvae. The ants escaped in a day or two; the *Microdon* larvae remained, adhering to the bottom of the box. At frequent intervals, for months, I examined my captives; in all that time, one of them did not, so far as I could discover, move from its original position, except when lifted by me. Replaced in the same spot always, it was content to "drowse" away existence. The other specimen wandered a few inches, now and then—a real *Microdon* nomad!

In about three months, one of the larvae died; the other was placed in spirit, and sent to a specialist. Though food experiments were tried, neither of the *Microdon* larvae would eat. Yet, when examined under a microscope, they showed signs of fairly vigorous life. For me, *Microdon*, in the larval stage, is a mystery. The metamorphosis may be known; but we have only shreds of knowledge concerning the habits of these remarkable creatures, for long thought to be molluscs.—C. BARRETT.

NOTES ON TWO SPECIES OF *SARCOCHILUS*, R. Brown.

By W. H. NICHOLLS.

In these notes, I intend to refer, chiefly, to those species listed in *The Census of Plants of Victoria* as Victorian forms, viz., *S. falcatus*, R.Br. (sickle-shaped leaves), and *S. parviflorus*, Lindl. (small-flowered).

S. falcatus, known to many as the "Orange-blossom" Orchid, in the *Census* is called Snowy *Sarcochilus*. When in bloom, it is admittedly the most beautiful of the two; but, unlike Lindley's species, is very variable; both as regards habit and the markings on the flowers. In Victoria, it grows in far distant parts of Gippsland. On the Cann River it festoons the moss-covered limbs of its various hosts in moist, dank gullies, in a remarkable manner. It is much more plentiful in New South Wales, also in Queensland.

Plant, Epiphytal. Leaves usually 3-8, up to 5 in. long, and $\frac{1}{2}$ in. to $\frac{3}{4}$ in. about the middle, narrow-lanceolate, somewhat falcate.* Texture often thick and very hard, more especially in Bailey's variety, *montanus*. The racemes of blooms, 1-3 usually, are produced from under the leaves, downwards, the expanded blossoms are thus seen to advantage.

Flowers, usually distant, but occasionally closely packed, by reason of the zig-zag character of the common stalk (peduncle.) (Fig. 3.) The diameter of the flowers, usually two to nine in number, individually is from $\frac{1}{4}$ in. to $1\frac{1}{2}$ in. They are usually white (pure cream flowers are known), with red linear and often purple, and other markings on the labellum, and on the under-side of the petals and the sepals.

As previously mentioned, *S. falcatus* is variable. In my experience, this variability is confined, chiefly, to the shape of the forward protuberance of the labellum, and the markings (or their absence) thereon. In var. *montanus*, the leaves are broad and comparatively short. In R. D. Fitzgerald's drawing of *S. montanus*, Fitzg. (var. *montanus*, Bailey) the flowers are cup-shaped and the

*Plants from Cann R. (H. B. Williamson).

purple ridge* (shown as pure blue in this drawing) on the under-side of the petals and sepals; is very strongly developed.

I have observed many plants of the var. *montanus*, and find that the flowers open widely, when fully developed. In some forms the linear markings, on the basal-lobe, and the purple-hued ridge on the sepals, etc., are absent. Sometimes this ridge is green. The most beautiful form of *S. falcatus* I have seen came from the upper reaches of the Allyn River (N.S.W.)—Rev. H. M. R. Rupp. I have flowered this form successfully for two seasons. The flowers are not so large as those of the Victorian form (which I consider to be the type), but are more beautiful.

The margins of the narrow petals, etc., are somewhat undulate, with a purple central ridge—prominent on both sides. The paired or lateral lobes of the labellum, are stained at their base, deep orange, and the lobes inside are conspicuously lined with purplish red.

These linear markings continuing in the opposite direction along to the stigma, as is usual. The basal-lobe well developed, rounded and conspicuously marked with deep purple or mauve transverse lines. This is one of the many specimens referred to (by H.M.R.R.) in the *Australian Naturalist*, June, 1926, as growing at 3,000 ft. and 4,000 ft. altitude, on the Upper Allyn River. "*S. falcatus* was there literally in thousands," growing on *Fagus Moorei*, and many other trees. This form has the long narrow leaves of the type.

The flowers of *S. falcatus* are easily fertilized, by transferring the pollinia from flower to flower on the point of a needle, first applying some adhesive—as the pollen masses are extremely hard and easily lost. The various forms are easily cultivated, and bloom between the months of August and November (inclusive), the blossoms emitting, then—during the warmer hours of the day—a very sweet fragrance.

Finally, *S. falcatus* is sometimes referred to as "resembling in general appearance *S. Fitzgeraldii*." Even Fitzgerald remarks upon it! I have a typical plant in my glasshouse, and I fail to see much resemblance! The habit is different, the leaves are narrow, comparatively long and conspicuously channelled, broad at the base, narrowing appreciably towards the tip, not falcate, but curved downwards or outwards. (See Fig. 4.) Fitzgerald, in his *Australian Orchids*, illustrates under *S.*

*Some flowers have a double, or even triple, ridge.

falcatus, Br., a *sarcophilus* exhibiting, in the flowers, strange features for Robert Brown's species.

S. parviflorus, often referred to as the "Butterfly" Orchid, is not so small-flowered as its name implies, when compared with some other species of this genus. I have observed many plants of *S. parviflorus*, in the gullies of the Dandenongs, specimens quite as large as the largest known specimens of *S. falcatus*, Br.

Several plants gathered last year (under permit) measured $7\frac{1}{2}$ in. in diameter. The long, and, in some instances, thickish roots were fully 2 ft. 6 in. in length. The leaves—eight in number—on each plant were (the longest of them) $5\frac{1}{2}$ in. in length, and $\frac{3}{4}$ in. at the widest part, definitely falcate. When the flowers expanded, I was surprised at their size, some measured $\frac{7}{8}$ in., others $\frac{3}{4}$ in. in diameter (across). Each plant produced two to three racemes, one specimen having nine and 10 flowers, another nine and five flowers. These particular plants were obtained from living *Sassafras* trees, *Asterosperma moschatum*, Lindl. But quite large plants were observed on the Musk, *Olearia argophylla*, F.v.M. Both trees, it seems particularly, to favour in these gullies, but is also found on the Blackwood and many other trees. In Tasmania, it has been collected from Cherry plum trees in an old orchid. (Mrs. Perrin.)

Plant, epiphytal. Leaves, similar to *S. falcatus* (type form only). But frequently the whole of the plant takes on a purplish hue, due, possibly, to the harder conditions of its environment.

Flowers, one to ten, always distant; sepals and petals greenish, with diffused purplish markings thereon, darker on the margins, very pale green at their base. Labellum, conspicuous, white, with rich purplish spots and linear markings extending also along to the stigma, as in *S. falcatus*. Paired lobes yellowish at the tips, the forward protuberance prominent. The flowers are sweetly fragrant.

The buds, when developing, have an unique appearance, characteristic of the species. (See Fig. 5.) They first appear, early in February, but do not materially develop until August, the flowering period being September to December (inclusive). I have successfully fertilized the flowers in the same way as adopted for *S. falcatus*. *S. parviflorus* is very difficult of cultivation. I have kept plants for three years, when they died off without any apparent reason. Mr. G. Scammell sends an interest-

ing note from New South Wales as follows:—"There is only one place I know where it grows—near Sydney—and there it is rapidly dying off. There does not seem any reason for this, for the conditions have not changed. The tree on which it grows is still living, and we have had no very dry seasons."

This species, which also occurs in Queensland, has, by some, been mistaken for *S. olivaceus*, Lindl. The leaves are broader, and usually of a darker green, and the flowers wholly—a rare golden-green colour, with some brown markings. This orchid is also found on rocks, in such cases the long roots find their way deeply into the loose soil.

When the Dandenong Range was comparatively little known, and the way there was by road only, Mr. C. French, Senr., wrote of *S. parviflorus*:—"This species was considered very rare in Victoria, when, about the year 1866, Mr. Taylor found a few specimens in the deep gully of the Dandenong Range."

Recently (October 20, 1928), I, with our Editor, visited one of the Dandenong gullies, hoping to see flowering plants in their habitat. My glasshouse specimens were then in bloom, and we accepted this as a good guide. Actually, the plants amid natural surroundings were with buds only—all quite small, possibly not to expand until mid-November (?) in this locality. The seeds of *S. parviflorus* must be very fertile, judging by our experience that day. Returning down the mountain side we found our way obstructed by a fallen musk tree—long since dead! On its thin branches were very small orchid plants (seedlings, too); we counted 15 specimens!

VICTORIAN SARCOCHILUS.

Key to Plate.

- Fig. 1—A typical plant of *S. falcatus*, R.Br.
 " 2—A typical plant of *S. parviflorus*, Lindl.
 " 3—Stalk with buds, from a plant of *S. falcatus*, var. *montanus*, Bailey. (Mt. Wilson, N.S.W.).
 Figs. 4—Leaves and flower of *S. Fitzgeraldii*, F.v.M.
 Fig. 5—Buds of *S. parviflorus*.
 " 6—Seed capsule of *S. falcatus*, var. *montanus*.
 " 7—Seed capsule of *S. falcatus*.
 " 8—Seed capsule of *S. parviflorus*.
 " 9—Typical, well developed bud of *S. falcatus*, var. *montanus*.
 " 10—Typical leaf of *S. falcatus*, var. *montanus*.
 " 11—Flower *S. falcatus*, var. *montanus*.

" 12.—Flower from underside *S. falcatus*, var. *montanus*, showing prominent ridges.

" 13.—Flower from typical form *S. falcatus*. Cann R., Victoria.

" 14.—Flower from Upper Allyn R., N.S. Wales.

The flowers of *S. falcatus* are approximately 1 inch in diameter. Other Figs. can be judged accordingly.

NOTES FROM MY DIARY.

July 4.—Dozens of Welcome Swallows hawking for food over a shallow lake.

July 7.—Noticed a White-faced Heron feeding in a swamp—obviously obtaining an abundance of food in a very small area; investigation showed that the bird was feasting on a small species of freshwater mollusc.

July 13.—A pair of Ground-thrushes alighted a few yards from me, and took a considerable time to progress over a small area of ground, searching it thoroughly for insects, and frequently giving forcible digs with their bills to procure any from below the surface. Immediately after alighting, they occasionally gave their wings a quick jerk, as a Wagtail does.

July 18.—A five-flowered specimen of *Cyrtostylis reniformis* noted.

July 21.—A number of Black Cockatoos frequenting *Banksia* trees, *B. serrata*, no doubt eating the immature seeds.

Aug. 8.—Counted 18 nests of Black Swan in Lake Reeves Sanctuary, and others still being built.

Aug 11.—Found a nest of Spur-winged Plover situated on a small mound of earth covered with *Mesembryanthemum australe*; four eggs formed the clutch, and were placed upon a few dried fragments of *Salicornia australis*.

Aug. 14.—First Tree-Martins seen, this Spring.

Aug. 18.—Watched a Red Wattle-bird chasing a Brown Hawk; the latter, however, turned upon its pursuer, compelling it to take shelter in a nearby *Banksia*; not to be beaten, the Wattle-bird again gave chase—this time with greater success.

Aug. 23.—Heard the first Pallid Cuckoo calling.

Aug. 27.—Noticed a Black Swan quickly rush to its nest, when a pair of Australian Ravens flew towards it; apparently the Swan was well aware of their partiality for eggs.

Sept. 10.—Watched a White-throated Tree-creeper collecting moss, and conveying it to a hole running perpendicularly down a dead *Banksia* stump, about 10 feet high. The bird alighted on the stump two feet below the hole, and climbed up in its usual manner. The nest was not visible from the entrance to the hole.

Sept. 14.—Found a nest of Red-capped Dotterel, placed among *Salicornia australis* and quite 50 yards from the lake-edge; a mere depression in the ground, on a small bare space, held two eggs. The black, peaty soil and dry Glasswort harmonised precisely with the mottled colouring of the eggs.

Sept. 25.—Flock of Sharp-tailed Stints—estimated at about 2,000—fossicking for food in the shallow waters of Lake Reeves.

FRED BARTON, JNR., Spermwhale Head.

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THE FIELD NATURALISTS' CLUB OF VICTORIA

The ordinary monthly meeting of the Club was held in the Royal Society's Hall on Monday, November 12, 1928. The President (Mr. F. E. Wilson, F.E.S.) occupied the chair, and about 100 members and friends were present.

CORRESPONDENCE.

From Mr. W. Thorn, advising the appointment of a Committee of Trustees to control the recently-created Kinglake National Park.

From Country Women's Association, requesting that arrangements be made for members of the Club to lecture at meetings of their association, in various part of the country.

REPORTS.

Reports of excursions were given as follow:—Wonga Park, Mr. F. G. A. Barnard; Frankston, Mr. L. L. Hodgson; Eltham, Mr. W. Tonge; Yarra Junction, Mr. E. E. Pescott; Pyrete Ranges, Mr. A. J. Tadgell; and Wattle Glen, Mr. F. E. Wilson.

ELECTION OF MEMBERS.

The following were duly elected on a show of hands:—As ordinary members: Miss G. Neighbour, Oak-grove, Brighton; Miss Florence Faul, St. Leonards-avenue, St. Kilda; Mr. L. J. Bailey, 9 Raglan-street, East St. Kilda; Miss Dorothy Kidd, B.A., 38 Peel-street, Windsor; Miss A. Evans, 31 Winton-street, Kew; Mrs. L. Adamson, E.S. & A. Bank, North Melbourne; and, as country member, Mrs. E. Holloway, Pecchelba.

GENERAL.

The President referred to the proposal to throw open for sawmilling the Cumberland Valley, near Marysville. He considered, after having made a special visit of inspection to the area, that it would be a matter for great regret if this were allowed. He thought that the Club should take strong action in order to preserve the area in its natural state.

Mr. P. C. Morrison submitted the following motion:—“That this Club views with alarm the proposal of the Minister for Forests (Mr. Beckett) to permit the milling of the magnificent specimens of Mountain Ash (*Eucalyptus regnans*) at the head of the Cumberland Valley, and that kindred societies be requested to combine with the Club to protest against the spoliation of this area, and to request the Ministry to have the Cumberland Valley proclaimed a National Park and sanctuary.”

Mr. E. E. Pescott seconded the motion, which was supported by Mr. F. G. A. Barnard, Dr. Heber Green, Dr. H. Flecker, Miss C. C. Currie, Mr. Chas. Barrett and Professor E. J. Hartung, and carried unanimously.

Mr. E. E. Pescott then moved:—"That the Committee be requested to approach kindred societies with the object of forming a deputation to the Lord Mayor, to request him to call a public meeting to protest against the proposal to permit sawmilling in the Cumberland Valley."

The motion was seconded by Mr. Chas. Barrett, and carried unanimously.

LECTURE.

A lecture, entitled "A Talk on the Natural History of Western Australia," was delivered by Mr. J. Clark. With the aid of a splendid series of lantern slides, the lecturer dealt in a very interesting manner with the various types of country in the South-West of Western Australia, and the many forms of animal and plant life to be found there.

EXHIBITS.

By Miss C. C. Currie.—Specimens of *Pultenea Cunninghami*, *Acacia decurrens*, var. *mollis*; *Thelymitra longifolia*, *Cratolaria laburnifolia*, *Boronia pinnata*, and *Calochilus campestris*, from Lardner.

By Mr. E. E. Pescott.—Specimens of *Pterostylis squamata*, R. Br. (Scaly Greenhood), collected in the Mallee by Mr. F. E. Wilson, F.E.S.; *Chiloglottis trapeziformis*, Fitz. (Broad-lip Bird Orchid), and *C. Pescottiana*, Rogers (Alpine Bird Orchid), both collected at Cravensville by Mr. H. B. Williamson; seeds of *Crinum* sp., collected at Horseshoe Lagoon, near Mildura, by Mr. H. B. Williamson.

By Mr. D. J. Paton.—Specimens of *Pterostylis rufa*, R. Br. (Rusty-hood); *Cheiranthra linearis*, A. Cunn. (Finger-flower), *Melaleuca decussata*, R. Br. (Cross-leaf Honey-myrtle), *Brachyloma daphnoides*, Bth. (Daphne Heath), *Humea ozothamnoides*, F.v.M. (Cottony Humea), *Helichrysum semipapposum*, D.C. (Clustered Everlasting), *Helichrysum obcordatum*, F.v.M. (Grey Everlasting), *Pultenaea largiflorens*, F.v.M. (Twiggy Bush-pea), and *Grevillea lanigera*, A. Cunn. (Woolly Grevillea); all from Bendigo.

By Mr. H. P. Dickens.—Small stone from Mt. Cole (near Ararat), also large tomahawk and rubbing-stone, ploughed up near Traralgon.

By Mr. V. H. Miller.—Specimen of *Sarcochilus falcatus* (Orange-blossom Orchid), from Queensland.

TO YARRA FALLS IN THE EIGHTIES.

BY GEO. LYELL.

In the old days, in 1888 and 1889, I remember taking part in Saturday afternoon and holiday excursions with the members of the Field Naturalists' Club, but I never remember any speech-making on those occasions. In those days, Mr. F. G. A. Barnard was secretary of the Club, as well as editor of the *Naturalist*, and he was one of the most indefatigable of the excursionists, usually acting as a leader. Messrs. A. H. S. Lucas and C. Frost were working at the lizards of Victoria, and were interested in the snakes, too. I remember six or eight of us going down to Tooradin for the day—two lady members with us. During the morning, Frost caught three fine, big Copperhead Snakes, which he carried in a canvas bag over his shoulder. When lunch time came, the provisions were pooled, and while the billy was boiling, the ladies unwrapped the packets of sandwiches. Coming to the canvas bag, they started to investigate that, but dropped it rather suddenly when they were told what it contained!

Healesville was another place I remember visiting, and Messrs. Barnard, D. Best, and J. Searle were with us on that day. There, for the first time, I took the butterfly, *Tisiphone abeona*. I little thought that investigations regarding the races of this butterfly, by my friend, G. A. Waterhouse, of Sydney, would bring him his degree as Doctor of Science.

My only long excursion with the Club was to the falls of the Upper Yarra, in November, 1889. There were six of us in the party—Prof. Baldwin Spencer, Messrs. Frost, Best, Searle, Ashworth, and myself. Our tent and provisions left Melbourne, by dray, two or three days earlier than we did, and were overtaken at Marysville. Four of us tramped from Healesville to Marysville, and there Prof. Spencer and Searle joined us. We stayed for the night at Keppel's, and were told that several exploring parties had made the attempt to reach the Yarra Falls, but had failed. Searle had taken a fine specimen of *Onychophanes lutosaria* at the light, at Keppel's on the evening before. He gave me this, and it was ten years or so later that I took another, in the Pyrene Ranges. Best knocked a fine *Archodia lasioemparia* into his beetle-umbrella, and I came in for that, too. Just outside Marysville, I remember taking the little *Philobota herodiella*, for the first time (I was then a raw beginner).

I fancy we camped the first night at something over 4000 feet, on the upper slopes of Mount Arnold; and the second night at an old, deserted wayside place, called "The Scandinavians." We found that the long-disused Woods Point road was impassable for the dray; so we planted that vehicle and part of our provisions, put pack-saddles on our two horses, and loaded them up. Another 25 miles and we reached the "Yarra Track Hotel"; five miles further on, we camped. In the morning it was raining, and when, ten miles further on, we came to the point where we had to leave the old road, things did not look too promising. We found the old surveyors' track which we were seeking; that had been cut back in the sixties, and did not appear to have been used since. We could trace it by the stumps of the trees that had been felled, but forest giants had fallen across it, especially in the gullies, and in some places we had to cut a way for our packhorses.

Three miles down this track, we were all wet through, and Best and Searle decided to tramp back, 50 miles or so, to the Yarra Track Hotel, and await our return there. The others determined not to give in yet. We had managed another two miles by four o'clock in the afternoon. Then, on a bit of rising ground, we cut a small clearing in the dripping scrub, put up our tent, and, after an hour's work, managed to get a fire going, in a big log a few yards away. We cut scrub for the floor of the tent, and then a lot of tree-fern fronds, and fortunately we had a bit of waterproof covering on our blankets. So, after a good deal of trouble, we managed to get a fairly dry place to sleep in. It was just as well, for it rained for the best part of three days, and the surrounding scrub was so wet it was impossible to go more than a few yards from the tent.

Being weatherbound cut our time short and made inroads in our provisions. The falls were still about 15 or 16 miles away (according to our maps), and we found that, if we did not reach them on the morrow, we should have to give it up. The rain stopped in the late afternoon, and we determined to make the attempt at daylight. We were up soon after 3 a.m., and got everything ready, and it was not quite 4.30 a.m. when we started, leaving the pack-horses with the man at the tent. We followed the old surveyors' track for some miles, losing it here and there, where a tangle of big trees had come down, and having to scout round till we found it again. Then we had to leave it and travel by compass, blazing the trees with a tomahawk, to show us our way back.

We went for miles through a big Beech forest, the going there being better for scrub, but worse for the surface-roots of the Beech trees. Some of these trees had a soft fungus plant growing in the branches, the colour and, some, the size of ripe apricots. Just at midday we reached the stream we were seeking, and were less than a mile above the falls. Owing to the previous days of rain, the river was full and about 15 feet wide and 3 feet deep. As we got to the top of the falls, the noise was so loud we had to shout to make ourselves heard. The waters were a white mass disappearing down the mountain gully.

Spencer and Frost managed to climb down over 600 feet, and took a number of photographs—the first time these biggest falls in Victoria had been photographed. Then Spencer lost his presentation aneroïd, and nearly came to grief himself. Meanwhile, Ashworth and I had found the nest of the Pink-breasted Robin—a little cup of green lichen, on a Beech bough overhanging the stream. I cut a big shield on the bark of a tree on the bank, with the letters F.N.C. and the date. I wonder if they are still decipherable! Spencer and Frost climbed up again, and, after a short rest, we ate a small bit of damper each—and had finished our provisions. It was 4 p.m. when we started for home, and we got along pretty well while the daylight lasted. Then we lit a fire, and waited an hour or two till the moon rose, when the fun began. One of us would find a blazing tree, and the others would scout out for the next. Progress was slow.

Though we had not much to carry, the camera and its plates, and even the tomahawk, became heavier and heavier, and every now and then we had to spell; every few yards there were logs across the path, some of them so big it was all we could do to climb over them. Fortunately, we found plenty of water, but had nothing left to eat. However, the night wore on, and the sun was in the tree-tops and the birds were awake when, at last, we sighted the tent, just before 4 a.m. That was a walk of 23 hours, and I suppose one of the longest in the history of the Club's excursions. The distance was only about 30 miles, but in the trackless mountain forest it seemed double that.

Our man at the tent had some rice boiling over the fire, and I distinctly remember the difficulty of keeping sufficiently awake to eat it, though we had been 12 hours without food. We told the man to wake us at nine; then we

struck our tent, fixed the packs on our horses, and started on our homeward journey. We came out on to the old Woods Point road at 1 p.m., and there the five of us divided one of the smallest tins of sardines and a crust of damper, and the last morsel of our provisions was soon consumed. We were about 15 miles from the Yarra Track Hotel, and were rather footsore. It was just getting dark when we reached there, and rejoined our friends, Best and Searle. There we had lots to eat (including, I remember, smoked blackfish, which they told us were taken there up to 6lbs. in weight), and felt too lazy to put up the tent (the accommodation was stretched to its utmost to accommodate Best and Searle). As it was raining, we slept on the wood floor of an old barn.

Next day we tramped the 25 miles to the spot where we had planted our dray and provisions; and the following day, over the Cumberland Valley, and along past Tommy's Bend, into Marysville, which we reached as the church bells were ringing on Sunday evening. There we had one of the biggest meals of our lives! Spencer caught the coach on the Monday morning, and the rest of us tramped through Narbethong over the Blacks' Spur, and, I think, camped at Fernshaw. Next day into Healesville, and the following to Yarra Glen and up into the Christmas Hills; then by the evening train to Melbourne—and home. We were away about a fortnight, and had tramped more than 200 miles.

The distances travelled were, of course, too long to permit of much collecting; but we felt that we were making history for the Field Naturalists' Club, and were content. The following year I came up to Gisborne, and my opportunities of attending meetings of the Club have been very few and far between: it is only through the pages of the *Naturalist* that I am able to keep in touch with our Club. I am very pleased to know that it is prospering greatly in these days.

"The Kangaroos here are immense in size and in number," writes Mrs. Herbert Barrett, from Mardie, via Onslow, Western Australia. "Station-owners give sixpence each for Kangaroo scalps and £3 for a Dingo scalp. Dingoes, I regret to say, play much havoc among the sheep." No descriptions nor measurements are given, but, probably, the marsupials referred to are Great Grey Kangaroos, *Macropus giganteus*, Zimm. Millions of Kangaroos have been killed, and still, in many parts of the Continent, heavy toll is being taken of the national animal.

The meeting of the Ethnological Section will be held at *Latham House*, 234 Swanston-street, on Tuesday 11st inst. Dr. Pullen, of South Australia, the well-known ethnologist will be present.

PLATE VII



Dr. George Bennett.

NOTABLE NATURALISTS.

DR. GEORGE BENNETT.

In my reminiscences of Professor Owen, I mentioned my mother's father, Dr. George Bennett, of Sydney, who was a great friend and constant correspondent of his, and also of John Gould.

Dr. Bennett was one of the early Australian naturalists, and author of *Gatherings of a Naturalist in Australasia*, published in 1860, and other books. My personal acquaintance with him was limited to a few days, in 1875, when he paid his last visit to England. I remember him, however, very distinctly as a slight but upright old man, rather short, of a pale-pink complexion, with blue eyes, a mass of very white hair, and a firm mouth. I recall him saying, one day at dinner, "You cook meat too much in this country; it should be eaten red"—a not very safe remark from a man who, at my request, wrote on his card his various degrees to the number of 38—M.D., F.R.C.S., F.R.S., F.L.S., F.Z.S., etc., etc.—which *did* impress me, as was probably intended.

We drove through the Dickens country, visited Gad's Hill House, the chalet in the garden on the other side of the road, where several of the novels were written, and went on to Cobham Hall, where the old Earl of Darnley came out of his seclusion and said nice things to my grandfather. Captain Nares, of Arctic fame, was one of the particular friends who was a visitor to Dr. Bennett at this time.

In the hall of my London birthplace and home, during early childhood, was a tall glass case, containing a stuffed male Lyre-bird, with tail spread erect, which was the first specimen sent (by Dr. Bennett) to the London Zoo, and was given to my mother at its death. It is now at the home of one of my sisters, at Hampstead.

An interesting circumstance in connection with Dr. Bennett occurred some ten years ago, when I visited Mr. Charles H. Angas, of Adelaide, at his country home, Lindsay Park, where he showed me some paintings of Australian scenes, etc., by his uncle, G. F. Angas, who painted the pictures for the coloured plates of birds, and other animals, which illustrated my grandfather's books.

While visiting Anlaby Station, near Kapunda, I saw on the diningroom wall, to my great surprise, a portrait in oils very similar to one at my own London home, which

proved to be that of Col. Cameron, an early resident of Adelaide, who was my mother's uncle, and also a relation of the owner of Anlaby, Mr. Harry Dutton, and Charles Cameron Kingston, the statesman. It was a shock to one to come upon this portrait, after an interval of nearly 50 years, and in a place so remote.

When, in 1857, Dr. Bennett secured from Captain Devlin, of the cutter "Oberon," the first specimen of a new species of Cassowary, which Gould named *Casuarus Bennetti* (Mooruk); he sent it to England under the care of Dr. Plomley, of Sydney, whose brother married my father's eldest sister, and lived in the town of Rye, Sussex, which was for many generations, and still is, the home-town of the Vidler family. Dr. Plomley's son was a great friend of mine until his death, in Sydney, a few years ago.

EDWARD A. VIDLER.

EXCURSION TO JACKSON'S CREEK.

A party of eleven accompanied the leader to Jackson's Creek on Show Day. On leaving the Clarkefield station, the railway line was followed westward for about a mile, to avoid the deep and narrow valley of a small tributary; then a direct line was taken for the junction of Jackson's and Riddell's Creeks. The country, so far, had been volcanic plain. On reaching the bed of the creeks at the junction, an exposure of bluish shale was examined. This is very rich in Upper Ordovician graptolites (chiefly of the genera *Diptograptus*, *Glimacograptus*, *Glossograptus*, and *Cryptograptus*), and was one of the collecting grounds (Ba 67) of the early Geological Survey, Sir F. McCoy having figured and described fossils collected here more than half a century ago.

An interesting discovery was made by the party, a fall of debris having exposed a second fossiliferous zone, not previously noted at this locality. Proceeding down the main creek for half a mile, we lunched in the shade of a gnarled willow tree, rooted among the massive basalt blocks, in the bed of the creek. Just below this, the creek tumbles 30 or 40 feet, into a deep basin, then winds through a gorge with almost vertical walls. The section here exposes at least two distinct flows of basalt.

After emerging from the gorge, the wider valley was followed for about a mile, and below Clarkefield railway station, the party halted before climbing again to the summit of the plateau. The climb here is long, but not difficult, as a graded road leads up from the creek. The journey along the creek reveals that the present drainage system has been super-imposed on an older system, the valley walls of which now project as cliffs of old sedimentary rock in the present valley. In places, these carry the older river gravels, cemented by volcanic agencies. The great thickness of basalt between these outcrops shows where lava filled in the old valleys.

The bushes of *Calythrix tetragona*, in the creek, were still far from the flowering stage, though further north, at Bendigo, shrubs of the same species had been noted in full bloom.—W. J. HARRIS.

GEOLOGY OF THE PYRETE RANGES.

By W. CRAWFORD.

That portion of Crown Land known as the Pyrete Ranges is about seven miles in length by four miles in breadth, and comprises the area drained by the Pyrete Creek and its tributary gullies.

The Ranges are a portion of the old peneplain of Victoria, which, together with the country to the east and west, has been elevated to a height of 800 feet or more above the basaltic plains of the Melton district, along an east and west line. This elevation may have taken place along a fault, or there may have been a simple bending of the strata. Where the Gisborne-Melton Road crosses the slope, there is a rise of 500 feet in about a mile and a half. The road cutting follows the strike of the leads, which here are Upper Ordovician, and are exposed for a considerable length. The softer rocks in the cutting are now a good deal weathered, but several years ago, on a careful examination, I could not detect any faulting, and the beds appear to be quite continuous. In the lower portion of the slope, however, the road passes over basalt.

To the east of the Ranges is Mt. Gisborne, a volcanic hill, 2105 feet in height, with its surrounding lava flows, into which the small streams which have their sources near the hill have not yet been able to cut very deeply. To the west of the Ranges are two volcanic hills, "Haire's Hill" (1980 feet) and Mt. Bullengarook (2207 feet). Unlike Mt. Gisborne, which has produced a number of lava flows, Mt. Bullengarook seems to have produced only one, which has gone south along the valley of the old Bullengarook River, the gravels of which are exposed in places under the basalt. This basalt is a hard drive rock characterized by an abundance of black phenocrysts.

A small stream takes its rise near Mt. Bullengarook, and flows south, over the basalt, in a shallow gully for about three miles, where it falls over the edge of the basalt into the deep gorge of the Pyrete Creek. This fall is known as the Cataract, and the gully is called Cataract Gully. At the Cataract, unbroken basaltic columns rise vertically from the old river gravel to a height of about 70 feet, and from the columns the surface slopes to the crest of the hill about 200 feet above the old river bed. Throughout the basalt, in hand specimens, is of the same character, and there is no indication of more than one flow.

About a mile south of the Cataract, the basalt sheet,

which has a width towards the north of about three-quarters of a mile, becomes very narrow, and has, in one place, been breached by the combined action of Goodman's Creek on the west and a tributary of the Pyrete Creek on the east. At this point there is a steep slope in the surface of the basalt, which is due, I think, entirely to lateral erosion by the streams above mentioned. After continuing for some distance as a narrow ridge, the basalt again widens out to about half a mile, and surface boulders show black crystals as at Mt. Bullengarook.

The Pyrete Ranges are composed of sedimentary rocks of Lower Ordovician age. They have been dissected by steep-sided, V-shaped gullies to such an extent that it would scarcely be possible to find any flat land except where branch gullies join the Pyrete Creek, where occasional alluvial flats up to about a quarter of an acre occur. The bed of the Pyrete Creek is upwards of 400 feet below the level of the surrounding country, and anyone exploring the Ranges must be prepared for a long, steep climb on the return journey.

Most of the peaks are capped by masses of quartzite and the ridges by hard, steep-dipping slate and quartzite bands. The greater resistance to weathering of the quartzite and sandstone tends to give the impression that such rocks are more abundant than slates, but in the gullies slate and sandstone appear about equally distributed. Many of the projecting masses of sandstone are much jointed, and the joints are filled with a band of ironstone about a quarter of an inch thick, usually in a double layer, sometimes with a central layer of quartz. In places, weathering of the sandstone has led to the formation of small eaves up to four or five feet in depth, and in these the hard joint layers project, giving rise to an appearance like the pigeon-holes of a writing desk. These dark recesses are sometimes used by bats as roosting places.

The Pyrete Creek, after flowing slightly east of south for about three miles, takes a sharp bend to the south west, and, crossing the strike of the rocks diagonally, continues on this course for about four miles to the edge of the Bullengarook lava, where it again turns south. This south-west portion of its course follows the strike of the rocks for a short distance, and then crosses it nearly at right angles, and so on in a series of short zig-zags. It probably began its career as a tributary of the old Bullengarook River, and, working back, captured the headwaters of a stream flowing

south-east, so forming the present Upper Pyrete. Some of the gullies and hills have acquired names of their own, such as "Slate Tunnel Gully," "Langford's Gully," "The Duck Holes," "Quartz Reef," "Ploughshare Ridge," "Round Top," etc.

The fossils so far found in the Ranges, with the solitary exception of one gasteropod, are graptolites and crustaceans. In the Pyrete Creek, west of Mt. Gisborne, and on the ridge above it on the west, three branched specimens of *Tetragraptus fruticosus* occur. Further south four branched specimens may be obtained. At the slate tunnel, between the Pyrete Creek and the Melton Road, *Didymograptus caduceus* is plentiful, and nearer the road *Osicograptus* occurs.

Outside the Pyrete Basin, in the next main gully to the east, the "Djerriwarrh Creek" Upper Ordovician graptolites occur, and the boundary between Upper and Lower Ordovician runs north-east from the Djerriwarrh Gully through the town of Gisborne.

Fossils are not common in the slates exposed in the bottoms of the gullies, and I have found that the best plan, when searching for them, is to go along a hillside, when, if likely looking fragments of slate are found, they may be traced upwards to the bed from which they have come. Igneous dykes may occur in numbers, but would be difficult to distinguish at the surface. I know of only three, two of them, cross the bed of the Pyrete Creek in an east and west direction, and are three or four feet wide and decomposed to a brown clay. The third is at Cockatoo Gully, a tributary of the Pyrete Creek, near the Bacchus Marsh Road, and is an acid dyke running north and south.

The gravel of the old Bullengarook River is gold-bearing, and has been prospected to some extent, but though occasional rich pockets have been found, alluvial mining in the area does not appear to be profitable. According to the miners, the gravel seems to have been laid down in a wide valley, with the gold distributed evenly through it.

The largest nuggets that I have heard of, from the district, weighed, respectively, 37ozs., 17 ozs. and 12ozs., and were all found southward from Mt. Bullengarook. Attempts have been made to quarry the slate in more than one place in the district, but, like the gold mining, they do not appear to have been profitable ventures.

The Pyrele Creek usually ceases running during the summer months, and the Ranges at that time of the year are dry and barren looking, but the deep, sheltered gullies, in the winter, or the hillsides in the early spring, when the wattles are in blossom, have an attraction all their own.

EXCURSION TO WONGA PARK.

Beautiful weather favoured the fifteen or more excursionists who visited Wonga Park on Saturday, October 13, and the five-mile drive, though a little rough in places, was greatly enjoyed owing to the alternation of orchard and bush. The Wonga Park District Flower Show was being held the same afternoon, and after a hasty glance at it the party was guided by a resident (Mr. Hooper) down a valley towards the Juniper Creek. A few orchids, including *Thelymitra carnea*, and other flowers, were seen, but the season was not so good for wild flowers as the previous year had been, and, besides, the country had been well-searched by children for exhibits for their part of the show. However, about 50 species in all were noticed in bloom, while some swarming larvae of saw-flies, and other objects, were collected.

About five o'clock, some members of the party returned to Croydon, while others enjoyed the hospitality of the Wonga Park folks, and remained to hear a lecture given in the evening by Mr. Arthur Jones, of the Department of Agriculture, and a member of this club. The thanks of the party are due to Capt. R. N. Robertson and Mr. A. C. Chandler for conveying members by motor to and fro, while Messrs. A. E. Opperman and N. P. McColl assisted in the same way.

I would like to remind members that, when an excursion is arranged where names have to be handed in, and the numbers limited according to the transport available, it is very disconcerting to the leaders to be faced with an excess of five or six members who had not notified their intention of being present. In such circumstances, they cannot expect accommodation to be found for them at the last moment without extra expense.

P. G. A. BARNARD.

The first meeting of the Anthropological Society of New South Wales was held at the Australian Museum on November 16 and another on December 3, at which Dr. W. L. Warner delivered the first lecture before the Society on "The Natives of Arnhem Land."

Briefly, the objects of the Society are:—The study of anthropology in all its branches, especially for the furtherance of knowledge concerning the aborigines of Australia and Tasmania, and the native peoples of the Pacific. Its desire is, also, to assist and encourage anthropological research in the areas named; and, lastly, to provide facilities for all persons interested in the science to have friendly intercourse with each other.

The president of the Society is Professor A. R. Radcliffe-Brown; the vice-president is Professor A. N. Burkitt; the committee consists of Mr. W. W. Thorpe, Mr. M. S. Stanley and Miss G. Pink. Mr. C. C. Towle is secretary and treasurer. The Society has received splendid support, and now numbers about 40 members, and enquirers are still asking for information concerning membership. A successful future is assured.

AUSTRALIAN PILL BEETLES.

Pill Beetles belong to the family Byrrhidae. All are more or less small species, and are usually dull in colour. In Australasia we know of about 50 species, which are grouped under seven genera.

Nineteen of our species have been assigned to the genus *Pedilophorus*, and included among them are some of the finest Byrrhidae in the world. Possibly the most beautiful of these is *gemmatus* Lea, which is of a brilliant metallic green colour, with the raised portions of its elytra tipped with bright orange-red. It is one of the largest of our Byrrhidae, and is one of the most striking insects found in its habitat, Tasmania.

Most of the brightly-coloured species occur only in Tasmania, and one might mention *Griffithi* Lea, *bryophagus* Lea and *carissimus* Lea, as other examples of brilliantly-coloured Byrrhids.

In Victoria, a handsome little insect is *venustus* Wilson, which I first obtained at Ferntree Gully, but subsequently found to have a fairly wide distribution throughout our mountainous country. One of the smallest members of the genus is *globosus* Wilson, a round, shiny black species, which may be taken fairly frequently in the Warburton district. Some *Pedilophorus* are quite devoid of "clothing," whilst others are densely covered with pubescence. On one occasion I took numerous examples of a member of this genus, with ants, at Lakes Entrance, Victoria, but the majority of the species are usually secured by teasing up and sieving moss, particularly that growing on logs and tree-trunks. The only two examples known of *atronitens* Lea I took from tree-fern trunks at Lorne, Victoria.

Another genus, which occurs in Victoria, is *Aspidiphorus*. The species are all minute beetles, and the best known of them is *humeralis* Black b., described from the Fernshaw district. I have taken examples of this species in the Warburton Ranges. Under rocks, on the plains to the north of Melbourne, I have collected still another species belonging to this genus.

The genus *Byrrhinus* appears to be confined to the northern portions of the continent, and, so far, only three species have been assigned to it. Byrrhids of the genus *Microchaetes* are quaint in appearance, having their elytra covered with numerous tubercles. Some species are sometimes taken in ants' nests, but they are more often taken from moss. In Queensland, I once took a *Microchaetes* from flowers of *Leptospermum*.

F. ERASMUS WILSON.

SWISS LAKE DWELLINGS.

By J. A. KERSHAW, C.M.Z.S.

(Curator, National Museum, Melbourne).

Among recent acquisitions to the ethnological collections in the National Museum is a valuable series of artifacts obtained from the sites of the ancient Swiss lake dwellings at Zurich, in Switzerland. These comprise a series of stone and bone implements and hand-made pottery belonging to the Neolithic period, and implements and ornaments of the later Bronze Age. All are in an excellent state of preservation, and serve to illustrate the habits and customs of man at those remote periods.

Among the stone implements are a number of axes, ground and polished, many of which are still firmly fixed in their short hafts of deer horn. There are stone flakes of various shapes and sizes, showing a considerable amount of careful secondary chipping on their edges, and some finely-worked scrapers and arrow and spear heads of flint.

The bone implements, made from the limb bones and ribs of animals, include a variety of pointed tools, all of which had been split and then finely ground to a sharp point. The larger ones were used as daggers, and the smaller ones probably as awls. In some instances they have been sharpened at both ends, while one has been ground to a broad, flattened cutting edge. Combs, spatulas and other articles were also made from bone and horn.

For cultivating the soil, a very crude hoe was used, fashioned from the large horn of an elk. This had been split and ground to the required shape, and a large hole bored on one side, apparently for the attachment of a handle.

The examples of hand-made pottery are very crude, with, in some instances, attempts at ornamentation by engraving fine lines along the outer margin. Most of these vessels are round-bottomed, and roughly fashioned rings of fire-hardened earth were made to serve as stands for them.

The Bronze Age is represented by a variety of objects. With the gradual introduction of copper, from which knives, small vessels and personal ornaments were made, and, later, the discovery of bronze by the mixture of copper and tin, a notable advance was made in the manufacture of implements of all kinds, and the use of stone for such purposes was rapidly discarded.

Bronze axes, knives, sickles, fish-hooks, and various articles of personal adornment are well represented. Sickles, used for cutting the crops, are small and broadly flattened, with

provision for the attachment of a handle. Knives, in shape and size, are closely similar to those in present use, and were probably similarly handled.

The pins, used for fastening clothing, vary in length from three to ten inches, the heads being of solid metal, and in most instances highly engraved. Bracelets, ornamented with fine engraved lines, pendants, rings, and large, disc-shaped buttons are also represented in this interesting collection.

Primitive people, living under conditions in which they were exposed to constant danger from wild animals or to attack by human enemies, were compelled to resort to various expedients in order to safeguard themselves against unexpected surprises. Among the methods adopted was that of constructing their dwellings upon piles driven into the muddy bottoms of shallow lakes, or in swamps or marshes, where, in such isolation, they were comparatively safe from surprise attacks from the shore.

In parts of Papua, the natives built arboreal homes, each consisting of a rude hut, placed high up in the branches of a tree, to which access was gained by means of a rough ladder, which could be readily removed in time of danger. In Venezuela, i.e., little Venice, there are said to still exist large community villages, consisting of numerous habitations, erected upon piles, and connected together by platforms, so that the whole forms an extensive pile-village, extending out into the water. Somewhat similar dwellings are known to have been constructed in some of the larger rivers in Europe. An island in the Rhine was used as the centre of a village, which extended over the surrounding shallow water by means of piles; while an island in the Seine, known as La Cite, is said to have been the centre of a small Gallic tribe of the Parisii, which occupied habitations probably of a similar structure.

In many parts of Ireland and Scotland, during the early development of these primitive people, small islands, situated in great marshes or swamps, formed refuges to the inhabitants, and are known as "Crannogs." Here structures were built upon piles as in the lake dwellings, and often strengthened by palisades; or, in many instances, high wooden rafts were constructed, forming artificial floating islands in the midst of the swamps.

Probably the earliest historical account of such habitations and modes of life of these ancient people is that given by Herodotus of a Thrasian tribe, which, in the year 520 B.C., dwelt in Prasias, a small mountain-lake of Paconia, in Roumelia, near the mouth of the Strymon.

During the very early stages in the development of man such ancient dwellings were occupied continuously for many hundreds—and in some cases, thousands—of years, and the sites have yielded wonderful treasures in the form of prehistoric objects, which have thrown much light on the habits and customs of these ancient people. To the prehistorian, the sites of these dwellings are especially interesting from the fact that the concentration, over very long periods, of hundreds of inhabitants, resulted in the accumulation in the shallow waters, and embedded in the mud, of a mass of tools and utensils and various articles of value, which had fallen from the platforms. These comprise objects of stone and bronze, bone and horn, as well as vessels of pottery and teeth and bones of animals, both wild and domesticated, which then existed, but some of which have long since been exterminated.

It has been estimated that the Stone period dates back from 5000 to 7000 years, and the Bronze period from 3000 to 4000 years.

Probably the richest discoveries of such prehistoric objects have been made on the sites of the ancient Swiss lake dwellings. The remains of these great pile-dwellings, which date back to the Neolithic and Bronze periods, are scattered through the various lakes, particularly those of Zurich, Constance, Neufchatel and Geneva, where, it is recorded, nearly 200 have been investigated. Some of these are very extensive, and as many as 300 wooden huts were comprised in one settlement, with probably 1000 inhabitants. At Wangen, it has been calculated that 4000 piles were used, though their erection probably extended over several generations.

Attention appears to have been first drawn to the Swiss lake dwellings in 1853-4, when, during an unusually dry winter, the water in the lakes and rivers sunk lower than had ever been previously known. The inhabitants of Meilen, on Lake Zurich, with the object of reclaiming some of the land, carried out dredging operations in the adjacent waters, in the course of which numbers of wooden piles, which had been driven deeply into the bed of the lake, were discovered, their tops, in many instances, being worn down to the surface of the mud, in others projecting slightly above it. These had evidently formed the support of great wooden platforms, on which were constructed habitations of wood, with thatched roofs, in which the ancient Swiss lived with their families and stock.

The platforms were connected with the shore by narrow bridges, which, in the event of attacks by enemies, could readily be removed, and thus afford a safe retreat. That many of these had been destroyed by fire is evident by the

discovery of great quantities of charred wood, which had doubtless formed portions of the platforms.

During dredging operations, thousands of implements, the accumulations of many hundreds of years, were found in the mud, some, such as axes, hammers, arrow heads and flaked knives, belonging to the stone period, while others of bronze, such as hatchets, knives, sickles, pins and needles of various kinds, fish hooks, armlets and other ornaments, were of a later period. Rude hand-made pottery, burnt remains of fishing nets, and even portions of plaited cloth, made from flax, have been recovered. Carbonised wheat and barley, and flat cakes of bread, indicate that during the stone period the ancient Lake-dwellers cultivated these cereals. Carbonised apples and pears, such as still grow in the Swiss forests, hazel nuts, stones of wild plums, seeds of the raspberry and blackberry, have all been recognised.

The implements, ornaments and pottery of the Bronze period in Switzerland closely resemble those of corresponding age in Denmark, thus indicating a widely spread uniform civilisation over Central Europe during that period. Implements discovered in various parts of England and Ireland are of exactly a similar nature.

Of the animal remains dredged at various localities, have been recognised no less than twenty-four species of wild animals and several domesticated ones; eighteen species of birds, three of reptiles, and nine species of fresh-water fish. The mammals include the bear, badger, wolf, fox, otter, beaver, wild boar, stag, roe-deer, elk, chamois, bison, wild bull and several smaller kinds. Domesticated species comprise the horse, ass, dog, pig, goat, sheep and several bovine races. That practically all these animals were used for food is indicated by the fact that all bones containing marrow showed evidence of having been split open.

A book by Mr. Gregory M. Mathews, entitled "The Birds of Norfolk and Lord Howe Islands and the Australasian South Polar Quadrant," is announced for publication; a limited edition of 225 numbered copies. It will contain 38 coloured plates and seven half-tone plates. The birds figured and described in the work are all those which have not been included in Mathews' "The Birds of Australia." Among them are such forms as (the two extinct Pigeons (*Hemiphysa spadicea* and *Junthaus godmanae*), the White Swamp-Hen (*Porphyrio albus*), also extinct, and now figured from the actual specimen for the first time since 1790, and the extinct Long-billed Parrot (*Nestor productus*). The Lord Howe Island Rail (*Tricholimnas sylvestris*) is another bird of special interest, as it shows a connection with New Caledonia. Special attention has been paid to the Storm Petrels, which are fully discussed and specially figured.

THE LILIES OF VICTORIA.

Part VII.

By H. B. WILLIAMSON, F.L.S.

In this, the final number of the series, the Iris or Flag Family is dealt with, as being allied to the Lilies.

FAMILY IRIDACEAE.

This family resembles *Amaryllidaceae* in having 6 petal-like segments and an inferior ovary, but there are only 3 stamens, and the anthers are erect, and open outwards. It contains the attractive garden favourites, *Gladiolus*, *Crocus*, *Iris*, *Ixia*, *Watsonia* and *Sparaxis*. Among our alien plants growing wild are the following representatives of the family:—African Corn-flag (*Antholyza*), two species of *Gladiolus* (*G. cuspidatus* and *G. grandis*), Cape Tulip (*Homeria*), Fleur de Lis (*Iris germanica*), Thread Iris (*Moraea*), Onion Grass (*Homalea*), Scour weed and Bermuda Pig-root (*Sisyrinchium*), Harlequin Flower (*Sparaxis*), and Merian's Bugle Lily (*Watsonia*). Cape Tulip and Onion Grass are among the worst introduced pests that we have.

KEY TO THE GENERA.

Perianth with 3 large outer, and 3 very small inner segments, style longer than the stamens, with broad-spreading laminae.

Flowers, white, spike or cluster, simple and terminal
anthers, only 2 *Diplarrhena*

Flowers, blue, spike solitary and terminal, anthers
3 *Patersonia*

Perianth with 6 spreading segments, style shorter than the stamens.

Flowers, blue, perianth-segments nearly equal, outer
bracts erect and closely sheathing . . *Orthrosanthus*

Flowers white, outer perianth-segments usually smaller
than the inner ones, bracts all membranous and
open *Labertia*

Genus DIPLARRHENA.

DIPLARRHENA MORAEA, Labill. Butterfly Flag. Fig. 1.

Quite glabrous in all parts; leaves chiefly radical, rigid, 1 to 2 feet long, nearly $\frac{1}{2}$ inch broad; flower-stem compressed, sometimes 3 feet long, surmounted by a pair of rigid, streaked, pointed bracts, from which protrude several large, tender flowers, with 3 large, outer segments pure white, and about $1\frac{1}{2}$ inches long, not quite symmetrical. The inner segments are scarcely more than half as long as the outer, and are often slightly tinged with violet and yellow. Filaments free, the upper one without any anther (d.). Style divided into 3

unequal, petal-like laminae, bearing the stigmas (d.), capsules (a.c.), acutely 3-angled. Common in South and East Gippsland, and found also in the South-West (Timboon). Its occurrence in the North-East is doubtful. Occurs also in the South of N.S.W. and in Tasmania.

Genus PATERSONIA.

Differs from *Diplarrhena* in having blue flowers, a regular perianth with a very slender tube, filaments united to the middle, and broad, spreading stigma lobes.

KEY TO THE SPECIES.

Quite glabrous.

Outer bract prominently streaked, perianth tube exerted, scape usually shorter than the leaves *P. glauca*

Outer bract not streaked, perianth tube not exerted, scape usually much longer than the leaves *P. longiscapa*

Beset with hairlets.

Stem leafless *P. sericea*

Stem leafy below the middle *P. glabrata*

PATERSONIA GLAUCA, B.Br. Short Purple-flag. Fig. 2.

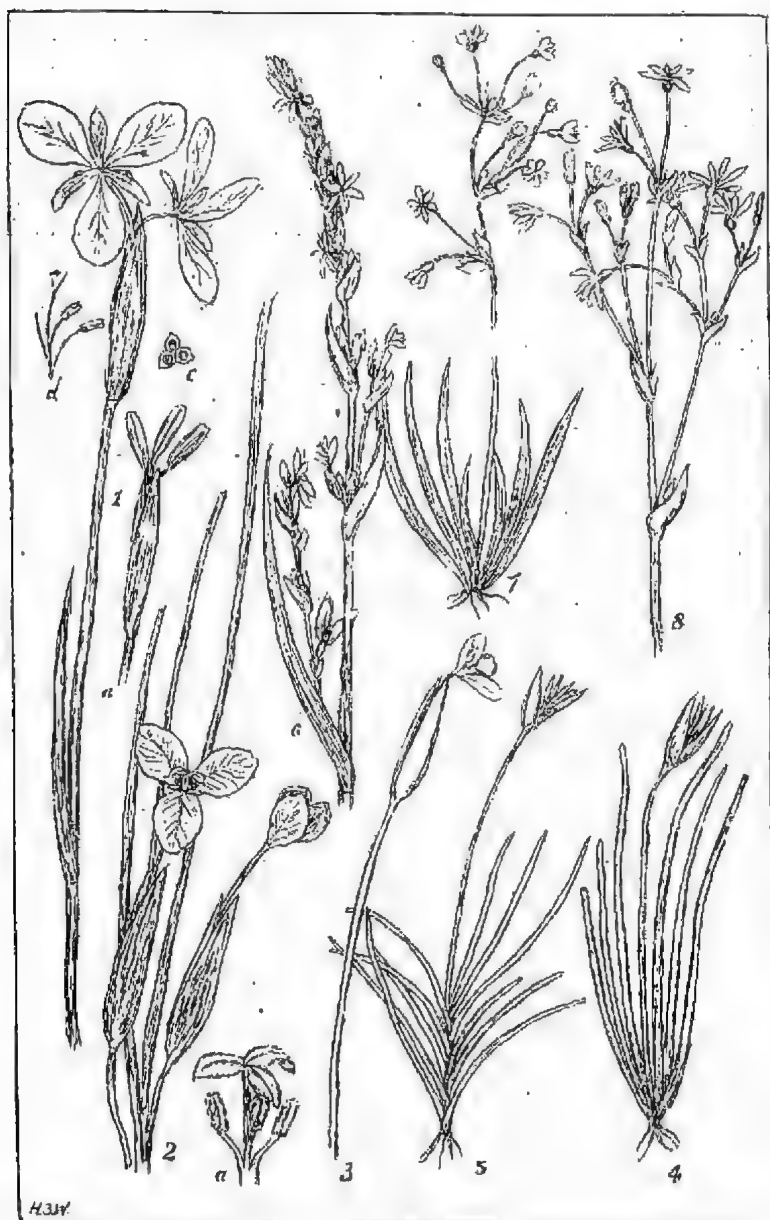
Leaves basal, rigid, 6 to 18 inches long, nearly $\frac{1}{4}$ inch broad. Flowers from a spike enclosed in 2 rigid, pointed, streaked bracts, 1 to 2 inches long. Outer perianth-segments broad, above $\frac{1}{2}$ inch long, at the summit of a slender tube, which usually exceeds the bracts by nearly $\frac{1}{2}$ inch. Inner segments very small, scarcely 2 lines long. Filaments united in a tube, Stigma (a) with 3 large lobes. Common in the southern half of the State. Occurs also in S.A., Tas., and N.S.W.

PATERSONIA LONGISCAPA, Sweet. Long Purple-flag. Fig. 3.

Closely resembling *P. glauca*, and distinguished from it by its perianth-tube scarcely exceeding the bracts, and by its outer bract being smooth, not prominently streaked. Usually the scape is much longer than the leaves, but this character alone is not reliable in determining the species. Distribution the same as that of *P. glauca*, except that it does not occur in N.S.W.

PATERSONIA SERICEA, R.Br. Silky Purple-flag. Fig. 4.

In this species the bracts, the upper part of the flower stem, and the lower part of the leaves are beset with silky hairlets, and the leaves all spring from the base of the flower stem. The spike is stout, and usually many-flowered; the outer bracts nearly 2 inches long, at first silky woolly, the wool often wearing off and leaving the bracts prominently streaked and black in the dried specimens. Rarely gathered in Vic-



1. *Diplarrhena*. 2, 3, 4, 5. *Patersonia*. 6. *Orthrosanthus*.
7, 8. *Libertia*.

toria:—Tambo and Genoa Rivers, Mueller; Hume River, Jephcott; Pine Mt., C. French. Occurs also in N.S.W. and Qld.

PATERONIA GLABRATA, R.Br. Leafy Purple-flag. Fig. 5.

Like the preceding, but with a more slender stem, which has leaves springing in two rows from its lower portion. The lower leaves also are shorter than in *P. sericea*, and are sharply keeled and fringed with hairs in the lower portion. Nat. Park, Wilson's Promontory, to Genoa, not rare. Its occurrence in the South, West of the Promontory, is doubtful. Occurs also in N.S.W. and Qld.

GENUS *ORTHROSANTHUS*.

Greek: *Orthros*, morning; *anthos*, flower.

ORTHROSANTHUS MULTIFLORUS, Sweet. Morning-flag. Fig. 6.

Leaves chiefly radical, flat and grass-like, but rigid and streaked at the base, about a foot long. Stems, 1 to 2 feet high, with an inflorescence 4 to 8 inches long. Spikes several-flowered, about $\frac{3}{4}$ inch long. Outer bract of the spike $\frac{3}{4}$ inch long, streaked, with broad, scarious-brown margins. Flowers blue, delicate, each lasting only a day. Perianth-segments blue, ovate, about $\frac{3}{4}$ inch long; outer ones rather narrower than the inner. Style branches linear. The genus contains five species, four of which are endemic in West Australia, while this species has been recorded also from Kangaroo Island and Portland (Cape Nelson), apparently only once gathered at the latter place (Allitt).

GENUS *LIBERTIA*.

LIBERTIA PULCHELLA, Spreng. Pretty Grass-flag. Fig. 7.

A plant with lax, grass-like leaves, mostly distichous-basal, rarely 6 inches long, pointed. Flowers small, white, on long, thin stalks in somewhat paniculated umbels or fascicles. Bracts membranous, streaked, spreading. Perianth-segments narrow, nearly equal, about $\frac{1}{4}$ inch long. Filaments thin. Anthers comparatively large. Style with 3 linear, spreading branches, minutely fringed at the end. Ovary globular. East Gippsland, Raw Baws, Tangil and Yarra Rivers. Also in Tas., N.S.W., Polynesia and New Zealand.

LIBERTIA PANICULATA, Spreng. Branching Grass-flag. Fig. 8.

A taller plant than the preceding, with larger flowers and with the outer perianth-segments smaller than the inner. Leaves up to 18 inches long and $\frac{1}{2}$ inch broad. Flower-clusters many, in a loose and irregular panicle, often occupying half the stem, while in *L. pulchella* the flower clusters are few or solitary. It appears to have been collected only at the Snowy

and Genoa Rivers (Mueller). Recorded also from N.S.W. and Qld.

Note on CRINUM.

An authentic record of this genus for Victoria has now been made. Through the good offices of Mr. Finnigan, of Mildura, I was able, last month, to inspect an area at Horseshoe Lagoon, about 20 miles west of Mildura, and close to the Murray River, on which what is probably *Crinum pedunculatum* is growing thickly. Seeds were abundant, and many have been distributed for experiment, the result of which, or the receipt of flowers from Mr. Finnigan in January, should enable us to determine the species.

ANCIENT PIRRIES.

The stone implements exhibited at the Wildflower Show by Mr. W. H. Gill, were collected by him in 1926, at Mulka, in the country of the Wonkonguru tribe, Lake Eyre region, South Australia. These stones, called Pirries, are said by the Wonkonguru natives, to have been made and used by some ancient tribe, which many generations ago, inhabited their country. The perfection of the forms and chipping of these Pirries represent a much higher culture than any stones made and used by the Dieri tribes or nation, and their old men state that they are deemed to be "Kootchi," or uncanny, and so the aborigines will neither touch nor use them.

EXCURSION TO THE PYRETE RANGES.

In perfect weather, some 20 excursionists spent Cup Day at the Pyrete Ranges, near Mt. Macedon, and about 45 miles from Melbourne. You will not find the Ranges, nor the Pyrete Creek, marked on the official maps of Victoria. The Ranges, though not shown on the plan, are situated in a portion of the Wombat State Forest area, and are hills of up to 1600 feet above sea level, near Mt. Bullengarook, sloping steeply into valleys 200 or 300 feet below.

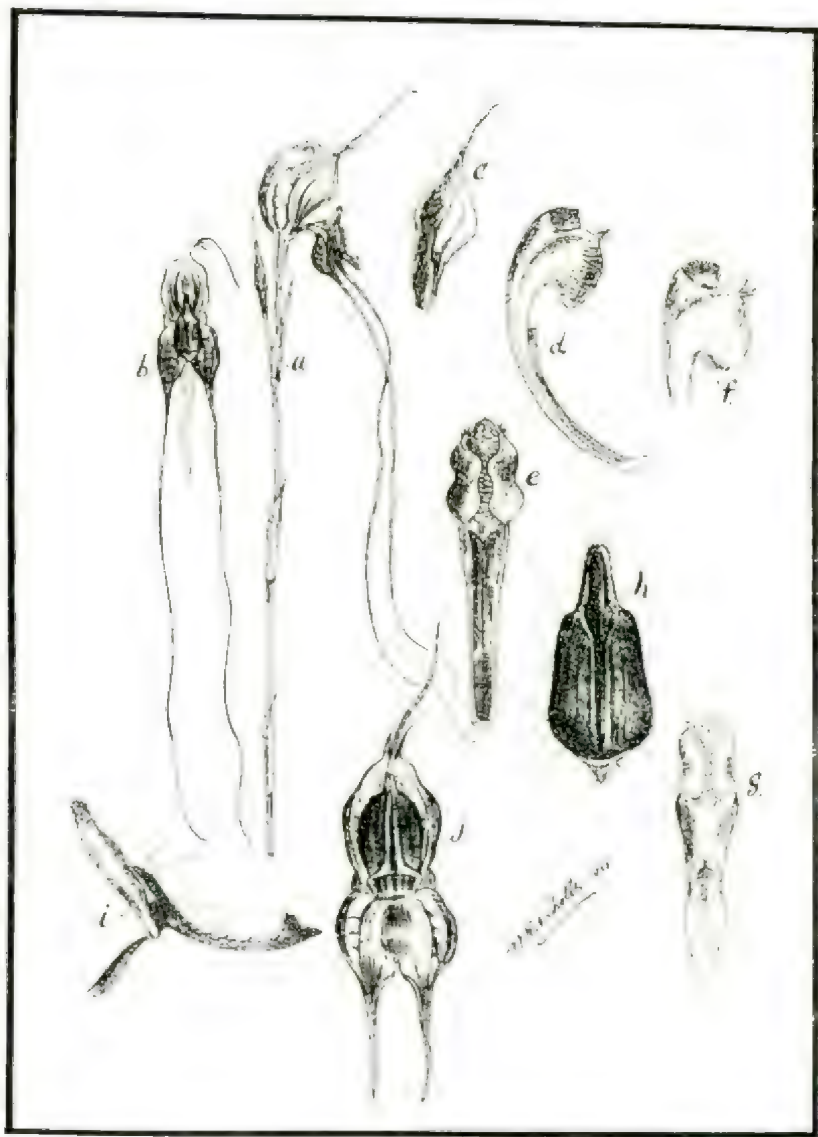
The Club is much indebted for its outing to several Gisborne residents, among them Messrs. Swinburne (president of the local Progress Association), Dixon, W. Crawford and G. Lych, who accompanied us on the ramble. Messrs. Lych and Crawford each gave a short talk to the party.

Mr. Crawford was a rare host. With him and Mr. Dixon, who had worked it in the hope of making it a commercial proposition, the party inspected a tunnel driven in on to the slate for a long way into the hillside. Many beautiful graptolites were broken out from the Ordovician rocks; some of these fossils, to the layman, gave the impression that the ancient creatures had crawled backwards and forwards many times, while others resembled large Chinese characters or protoplasmic forms of life with the tooth-like edges very marked.

The plant life noted comprised 142 species, of which 86 were found in flower. There were eight species of *Acacia*, seven or ferns and eight of orchids; of the last, *Pterostylis alpina*, *Cay-loana major* and *C. minor* were the rarest. The Common Daisy (bellis) was found growing abundantly wild as we approached the old Gisborne township, in the grass on the roadside.

A. J. TADGELL.

PLATE VIII



Pterostylis Woollii, Fitzgerald.

A NEW VICTORIAN GREENHOOD.

Pterostylis Woollsii, Fitzg.

By W. H. NICHOLLS.

The discovery, in Victoria, of this remarkable species is of more than passing interest to students of our orchidaceous plants. It is a notable addition to the list of Victorian species (see *Census of Plants of Victoria*, 1928). It was discovered near Rushworth, in the north-east, in November, and was forwarded to the writer by Mrs. Edith Rich, who recognised the specimen as something unusual.

The plant was growing in an exposed position, in the bush country, where many species of terrestrial orchids occur, including such interesting and unique types as *Caleana Major*, R.Br. (large duck-orchid) and *Calochilus imberbis*, Rogers (Beardless Calochilus).

Pt. Woollsii belongs to the "Rufa group" of Greenhoods, all of which are somewhat alike in general appearance. The other Victorian members of this group are *Pt. Rufa*, R.Br., *Pt. Mitchellii*, Lindl., *Pt. squamata*, R.Br., and *Pt. pusilla*, Rogers. Salient characteristics of *P. Woollsii* are the exceptionally long "tendrils," or prolongations, to the conjoined sepals (up to 3½ inches), and the uniquely-fashioned labellum, which is (as is usual) very sensitive. R. D. Fitzgerald's description in *Australian Orchids*, Vol. 1 (where a faithful illustration appears in colour) is as follows:—

Pt. Woollsii.

Bracts leafy, large sheathing bract beneath the flower, enclosing it when in bud.

Tails to the lower sepals two and a half to three inches long. Labellum lingulate, appendage lingulate with a few hairs at the end, a second lingulate appendage in the centre of labellum near the point. Wings of column short and blunt; small point at the upper angle, well defined. Stigma forms at the top a bifid hood. Anther very short and rugose. Leaves yellow and withered.

Flowering period, October, November, December.

Fitzgerald named this species after his friend, Dr. Woolls, who, he writes, "contributed so largely to the knowledge of the Botany of N.S. Wales, and who kindly sent me (Fitzgerald) specimens discovered by him in the neighbourhood of Richmond." Fitzgerald also obtained this species from Boorowa, through Mr. G. H. Sheaffe. There are a few minor differences between Fitzgerald's specimens and the Rushworth specimen, as follows:—The plant has a solitary, almost wholly green, flower (other markings being yellowish brown), and a small rudimentary bud. The upper margins

of the stigma (highly placed in this specimen), though bifid, as referred to by Fitzgerald, *does not* form a hood. The small points to the column wings are *not* well-defined, but somewhat pectinate.

The specimen will be forwarded to the National Herbarium, Melbourne, where some New South Wales specimens of this species are preserved.

KEY TO PLATE.

Pterostylis Woollii, Fitzg.

- (a) Specimen from N.E. Victoria.
- (b) Front view of flower.
- (c) A petal.
- (d) Column from side, showing point with cilia, and the in-turned marginal hairs showing through the transparent wings.
- (e) Column from front, showing stigma with bifid top.
- (f) Column (top) from side, showing well-defined point (after Fitzgerald).
- (g) Column from front, showing hooded top of stigma (after Fitzgerald).
- (h) Labellum, front view.
- (i) Labellum, side view.
- (j) Flower, from front, Labellum closing entrance.

MOORA STONES.

Moora stones represent the Lake Eyre Desert Tribes' belief in a concrete form, in a Spiritual Being or God. They are exceedingly rare, only two sets being known to exist, and of these one is in the possession of Mr. W. H. Gill, a member of the Club, who exhibited them at the Wildflower Show this year, with the following explanatory note:—

Dieri Confederation of the Lake Eyre (S.A.) Desert Tribes. Wonkonguru Tribe: "The larger of the two Moora stones represents the male element, and the smaller stone the female element. By anointing the stones with fat and red ochre, which possesses a sacred influence, they appeal to the Moora to bring to them the benefits to the individual or tribe of that they pray for.

The head person of each "Murdu," or Totemic Group, is the bearer of the Moora belonging to that group, and if there is no one to carry on or perpetuate that group, the Mooras are buried with the body of the last representative. Each Totemic Group had separate Mooras.

The natives are extremely reticent in guarding the existence of these Mooras, and have never been known to part with them before these came into my possession, in 1926. Ever since the aborigines came into contact with the white people, they have guarded and never divulged the existence of these sacred Mooras, and beyond those in my collection, no other examples are in any museum in the world, or in the possession of any white man.

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No. 541

THE FIELD NATURALISTS' CLUB OF VICTORIA.

The ordinary monthly meeting of the Club was held in the Royal Society's Hall on Monday, December 10th, 1928. The President (Mr. F. E. Wilson, F.E.S.) occupied the chair, and about 100 members and visitors were present.

CORRESPONDENCE.

From Marysville Tourist Association, expressing appreciation of the Club's action in regard to preservation of the Cumberland Valley.

From Mr. L. G. Chandler (Red Cliffs), drawing attention to the danger to bird and animal life caused by poison spraying of pasture lands, to destroy insect pests.

Mr. E. E. Pescott, F.L.S., moved that Mr. Chandler's letter be referred to the Committee for consideration. Seconded by Mr. C. Barrett and carried.

REPORTS.

Reports of excursions were given as follows:—Wandin, Mr. E. S. Hanks; Botanic Gardens, Mr. J. Stickland.

ELECTION OF MEMBERS.

The following were duly elected on a show of hands as ordinary members:—Misses E. C. and L. R. Parker, St. Kilda; Miss E. Rampling, Caulfield; Dr. Newell, Melbourne; Mr. W. S. Abraham, Melbourne; Mr. Chas. Wallman, Canterbury. As country member: Mrs. Peter Larsen, Maffra; and as associate members: Master Donald Barrett, Elsternwick; and Master Desmond Hannan, Middle Brighton.

GENERAL.

Mr. E. E. Pescott, F.L.S., stated that excursions, financed from the special fund, made available for the purpose by an anonymous donor, had been undertaken by Messrs. H. B. Williamson, J. Clark, and F. P. Morris, to various Victorian districts, and valuable material had been collected, including several new species of plants and insects.

The President announced that application had been made to the Minister of Forests to receive a deputation relative to the proposal to create an area in the Cumberland Valley a National-Memorial Park and sanctuary, but that the Minister had deferred receiving the deputation until he had made an inspection of the locality.

Mr. E. E. Pescott, F.L.S., moved that the congratulation:

of the Club be sent to Mr. R. D. Elliott on his election as a Senator. Seconded by Mr. C. Barrett, and carried unanimously.

The President announced the presentation, by Mr. Edward A. Vidler, of a copy of a book, "Journal of a Naturalist," formerly owned by Dr. George Bennett, and containing his book-plate.

LECTURE.

Dr. R. H. Pulleine, of Adelaide, delivered an extremely interesting lecture on "Australian Trap-door Spiders," in the course of which, with the aid of an excellent series of lantern slides, he explained the ingenious devices and strange habits of these creatures. The lecture was followed with much interest, and a hearty vote of thanks, moved by Mr. E. E. Pescott, F.L.S., seconded by Mr. C. Daley, B.A., F.L.S., and supported by Mr. S. Butler, was carried unanimously.

EXHIBITS.

By Miss J. Raff, F.E.S.—(a) Flowers and bulbs of the White thyrse-flowered Star of Bethlehem or "Chinkerichee" (*Ornithogalum thyrsoides*), from South Africa; (b) Copy of "Gatherings of a Naturalist in Australasia," by Dr. George Bennett, 1860—from the University of Melbourne (Zoology Department) Library.

By Mr. C. J. Gabriel.—Marine Shells—*Dione lupinaria*, Linn., C. Australia; *D. rosea*, Brod., Mazatlan; *D. brevispinata*, Sby., Peru; *D. dione*, Linn., C. America; and *D. multispinosa*, Sby., Panama; also *Magilus antiquus*, Mont Mauritius, a univalve Genus which lives in coral. The extension of the lips of the shell of *Magilus* enables the animal to keep on a level with the surface of the coral, as it continues to increase in size; as the shell grows, the tube behind is filled with solid calcareous matter.

By Mr. E. E. Pescott, F.L.S.—(a) Ancient grooved stone axes and flint scraper implements, uncovered after a heavy "blow" last month in the Western District; (b) cultivated specimen of *Hibiscus Huegelii*.

By Miss E. Hart.—Specimen of New Zealand Christmas Bush, *Metrosideros tomentosa*.

By Mr. A. E. Opperman.—(a) Specimen of Cedar Wattle, *Acacia elata*, with seed-pods and new buds on same branch; (b) White Geraldton Waxflowers; (c) Case-moths.

By Mr. A. E. Rodda.—Sandhill Snail, *Helix pisana*, introduced from Europe, now common at Geelong.

By Mr. W. H. Nicholls.—Drawing of new species of Orchid—a form of Beard Orchid (*Calochilus*).

NOTES ON THE WHIPSNAKE.

BY (MRS.) E. H. LINTON, Springfield, Tasmania

The brighter, more showy colours of a snake's courtship time are assumed in less than an hour, I find, having had snakes of different species under close and continuous observation for several seasons. This rapid change of colour is most marked, and most easily seen, in the Whipsnake. In this beautiful little creature the scales give a netted appearance to the smooth epidermis, just as though an outer pellicle, scarcely chitinous, lay in tiny rings, like a mesh of tulle or network, over its slim length.

Sitting down one day on a stony mound, partly in the shade, I disturbed a basking Whipsnake, which promptly glided beneath a loose ridge of stones nearby. I remained very quiet, however, and the small head soon reappeared. After fixedly gazing at me, and flickering its tongue (the snake's attitude in regarding an unfamiliar object), the snake drew its slender brown body slowly, lithely, and with scarcely perceptible ripple of movement, to its former position on the stones. It was then that I learned how a snake coils itself, a position assumed only when the creature is convinced of its immunity from danger. The loops made in moving beneath and around the obstacles in its way lie motionless for a while, and then, the snake being confident that all is safe, with the ventral plates pressed flat to earth, the head glides up and around the nearest loop. Then the body is drawn into circle after circle, always on the inner side of the preceding one, until, finally, the head is lifted and placed transversely over the close-set, neat coils. Sometimes, too, the tail jerks itself free and comes to lie loosely in a similar position.

I have observed this very interesting performance more than once, and it invariably took place in the same manner, the coiling being effected by the head and anterior part of the body moving on the inside of the inert posterior portion, which is only dragged into closer coils as the head glides round. Moreover, the centre of the posterior under-surface, as so often portrayed in illustrations of resting or coiled snakes, is never visible, the ventral plates being always flatly pressed to the ground. In glancing around, as the snake moves, the head, and what may be termed the breast, are raised, and as swiftly lowered. Sometimes, too, when in a defiant or threatening mood, it might be said to stand almost on its tail; but seldom are the ventral plates displayed for more than a third of the body's length. It cannot, I think, be truthfully said that a snake ever lies on its side and dis-

closes its abdominal or its caudal plates; these parts, as I have stated, always lying flat on the surface of the ground.

But to revert now to the quick changes of colour that take place in the Whipsnake. Having at last coiled itself comfortably, its small head towards the observer, with eyes doubtless as wideawake as they seemed, it lay motionless for a while, in the full blaze of the sun, only the dark tongue now and again flicking out, or the mouth, slightly opening, showing the black edge of its white-lined lip. The olive-brown body, with its soft-surfaced appearance, had no more lustre than is seen in undressed kid or suede, no metallic gleam or glittering burnish as in some lizards, nor the lacquered surface of the embossed cuirass of its large congener. But now, on this velvety cuticle overlaid with close-lying net, a greenish light appeared to play, to settle, to grow in intensity until very soon it gleamed through the olive-brown as olive green, then brightened to a lighter and still brighter shade.

I opened and shut incredulous eyes, but they were not deceived. It wasn't the moving light. No, the snake, a grass-green snake, was there; and now was moving; quiveringly the head passed slowly over the coils, drawing the body after it until the little creature lay at full length with upraised head. After a few moments, it passed around a stone, lingeringly, as if undecided in its purpose and giving the impression that it was listening or looking for something. And now the erstwhile transparently-pale vertex-plate was tinged with, or else lying on, a yellow ground, in tint like the just visible tips of the ventral plates which, as far as could be seen, were now suffused with a pinkish glow.

Thus, in full courting attire, *Denisonia coronoides* set off, not to trail and find a mate, but to be trailed and found by one. And very speedily, perhaps in the same marvellous way that the male moth becomes aware of the female at mating-time, the male snakes are guided to the place she has just left or strike her trail; and perhaps four or five suitors may be pursuing her, coming from all quarters, quite disregarding of anything in their way that they would ordinarily avoid.

One season, a green female, closely followed by a dark red male whipsnake, came into my verandah on the eastern side of the house; shortly afterwards, another was encountered, making a purposeful way through a gate on the northern side; and yet two more from other points of the compass, making for the same bourne at headlong speed. The last of these, evidently recognising that he had been anticipated,

changed his mind and, turning aside, changed also his raiment, the small, thong-like body fading quickly, as does the frog's, to its usual dusty tint; so speedily lost are these shades which seem to be the result of excitement rather than for allure-ment.

ETHNOLOGICAL SECTION.

The monthly meeting of this section was held on Tuesday, December 11, at Latham House. Dr. R. H. Pulleine, of Adelaide, was present, and gave an interesting account of the operations of the Anthropological Society of South Australia. He also outlined the work done, under a grant from the Rockefeller Institute, in examination of Australian blacks at Ceduna and other places, the results of which, in regard to tests in hearing, eyesight, recognition of colour, intelligence, blood quality, etc., as well as observation of methods of securing food and of tribal habits and customs, will be published.

Dr. Pulleine was accorded a hearty vote of thanks for his instructive address.

A discussion took place in connection with the alleged shooting of aborigines in Central Australia, and the general condition and treatment of the natives.

On the motion of Mr. J. A. Kershaw, seconded by Miss Hodgens it was resolved:—"That the Commonwealth Government be urged to make a thorough enquiry into the present conditions and future possibilities of the Australian aborigines, and, with that purpose in view, to obtain the services of the most prominent men accustomed to the governing of subject races and learned in the psychology of the primitive mind."

The next meeting will be on Tuesday, February 19, 1929.

EXCURSION TO BOTANIC GARDENS.

About nine members took part in this excursion. Attention was devoted to the large lake only, gatherings being taken from various parts. Some forms of considerable interest were noted later, as the result of microscopical examination.

Volvox globator was found to be very numerous, as usual; but the most satisfactory feature of the afternoon's work was the taking of a very rare and beautiful rotifer, seen for the first time, so far as we are concerned. It was described in December, 1891, in a paper read before the Royal Society of Victoria, by Messrs. Anderson and Shephard, and named *Lacinularia reticulata*. Unlike most *Lacinularias*, which form large colonies, this species is found solitary. Its very large corona makes it a most attractive object. The habitat given previously was Brighton Beach, no longer a happy hunting-ground for naturalists.

Limnias ceratophylli, a common rotifer, usually found as a solitary creature, was noted in a large colony, the tubes of the younger being superimposed upon those of the older. The numerous loriceæ of the pretty little tube-dwelling protozoan, *Vaginicola crystallina*—in most cases empty—indicated that this animal had been exceedingly plentiful quite recently.

J. STICKLAND.

THE GREAT PALM COCKATOO.

BY C. BARRETT.

It has been said that the Great Black Palm Cockatoo, *Microglossus aterrimus*, exists solely by virtue of its beak. This is not true of the species in all parts of its range. No other bird may be able to open the stony Kanari nuts, which constitute the great cockatoo's chief food in New Guinea; but *Microglossus* is well able to subsist on nuts of other kinds: and in captivity it takes kindly to a mixed diet, including walnuts, almonds, fruit-stones, etc.—at least a young bird is thriving on such varied meals, in a Melbourne aviary.



Photo by C. Barrett

Certainly, the large and powerful beak of *Microglossus* is its principal asset in the competition for food in its natural haunts, since it is able to eat nuts forbidden to other species with smaller bills. The kanari is a nut too hard for them to open.

Recently four young examples of the Great Palm Cockatoo were sold in Melbourne. They came from Cape York, to which this giant cockatoo extends its range, from Papua and

the Aru Islands. One of the birds was purchased by Dr L. J. Clendinning, "Langley," Malvern, who has large aviaries, and is keenly interested in aviculture. His collection includes a pair of beautiful Papuan parrots, *Eclectus pectoralis*, in which the female is as splendidly coloured as the male.

When I entered the aviary at "Langley" in which the Great Palm Cockatoo is domiciled, with other cockatoos and parrots, the giant was perched on a dead bough, beside a pygmy white cockatoo, from the Moluccas. *Microglossus*, when we tried to guide him into a "good light," became ill-tempered. Several times he attacked the little Moluccan bird, and was generally on the offensive, huge bill open, and the crest of long, loose feathers erect. Not an amiable bird, apparently; but he had cause for annoyance, being bothered by a nature photographer, when he wished to doze, undisturbed, on a perch in the shade.

Dr. E. A. Dombroin, of Sydney, who received a young *Microglossus* from Cape York, some years ago, states that it proved to be one of the most gentle birds he had ever seen in captivity. He mentions its agility, and this was very noticeable in Dr. Clendinning's bird. Repeatedly the young *Microglossus* jumped, with both feet, from bough to bough of the dead tree in the aviary, and finally on to the gable roof of the shelter. He was persuaded, after much trouble, to cling to a broom handle, and he lowered to a perch within range of the camera.

Compared with its big head and beak, the Great Palm Cockatoo has a small body. Its pectoral muscles are not proportionate to the bird's size, and, judging by observations in a large aviary, it is a weak flier. Probably, in the natural state, it resorts to flight infrequently. That, however, is merely conjecture. The huge-headed Hornbills are not weak on the wing, though they may look clumsy.

Few naturalists have been privileged to see the Great Palm Cockatoo as a wild bird. Alfred Russel Wallace has given an account of its habits, in the most delightful wander-book of a naturalist ever written. He describes the first specimen he obtained as "a great prize." The Palm Cockatoo flies slowly and noiselessly, he says, and may be killed by a comparatively slight wound. Its special food is the kanari or canary nut, which grows on a lofty tree (*Cusarium commune*), abundant in the island haunts of *Microglossus*. The shell of this nut is so hard, that a hammer is needed to crack it. The cockatoo opens kanari nuts in an ingenious manner, described in detail by Wallace (*Malay Archipelago*, 10th edition, pp. 341-2). It is of interest to note that one of the young birds brought to

Melbourne is being fed largely upon the hard-shelled Brazil nuts. It opens them with ease.

Aviculture is becoming more popular in Australia. No bird-lover likes to see birds in cages, but in a large aviary even the Great Palm Cockatoo may live happily. The cage should be condemned. We can encourage aviculturists, who have a real interest in bird life, and add to our knowledge by their observations. It is hoped that, in the near future, no person will be permitted to keep birds, excepting, perhaps, canaries, in cages which deprive them of the joy of flight. Aviaries of ample size are essential for practically all the species popularly termed cage-birds. The recently-formed Avicultural Society of Victoria, I am assured, is strongly in favour of this view.

EXCURSION TO WANDIN.

There were nine members of the Club present at the outing to Wandin on Saturday, November 24. On the way from the station to the Stringy Bark Creek, many wildflowers were noted in bloom—a large patch of blue flax-lilies being specially admired. The nest of a quail, containing four eggs, was examined. The bird rose from before the feet of a member of our party, and this led to the discovery of its nest. From an examination of the eggs, we are of the opinion that it was the Painted Quail, one of the more uncommon species.

After lunch, the party examined the nests and nesting sites of nine or ten species, including:—Silvereye *Zosterops lateralis*; Sacred Kingfisher, *Halcyon sanctus*; Jacky Winter, *Microeca fascians*; Magpie-Lark, *Grallina cyanoleuca*; Whip-bird, *Pachyodes olivaceus*; and Rosella Parrot, *Platycercus elegans*.

A pair of Sacred Kingfishers were busy drilling a hole in the bole of a white gum; the birds, perching some distance off, then flying at the spot selected and striking it with the bill. The nest of a pair of Whip-birds was the last to be visited.

E. S. HANKS.

In December I found a moss-covered nest of the Yellow-faced Honeyeater, *Ptilotis chrysops*, built in the branches of a Swamp Tea-tree, on the banks of Diamond Creek. It contained three fresh eggs. I kept the nest under observation. On January 2 I visited the nest. On approaching, I saw what I took to be one of the parent birds slip away from the nest; but, on looking closer, was surprised to see a Brown Snake lying full length on the branches and very still. I could not hit it from above, but gave it a good undercut; and it slipped into the water about ten feet below. It wriggled about under water for awhile, sending up bubbles, and then disappeared. While I was watching its movements in the water, one of the parent birds came to the nest, to find nothing but a portion of one of the young birds!—W. C. TONGE.

A NEW VICTORIAN ORCHID.

By W. H. NICHOLLS.

CALOCHEILUS RICHII, N. Sp.

Planta terrestris, gracilis, 25 cm. alta. Folium solitarium, subulatum, canaliculatum. Caulis bracteae 2, subulatae, 6-7½ cm. longae. Flores 2, patentes, pedicellis gracilibus. Ovaria sub-gracilia, Bractae parvae, subulate. Perianthi segmenta venosa. Sepalum dorsale oratum, cucullatum, concavum, acutum, 1½ cm. longum, 9 mm. latum. Sepala lateralibus, 13 mm. longa, 4½ mm. lata, ovato-lanceolata, diversa. Petala lato-patentia, ovato-falcata, concava, 7 mm. longa, 4½ mm. lata. Labellum sessile, 13 mm. longum, 8 mm. latum, basi contractum, rectangulare, angustum. Lamina orbicularis, marginibus integris, decorsis. Callis densis, brevibus vel sessilibus. Linae extensio, tubiformis, apice acuta, sine-callis, venosa. Columna erecta, 4 mm. longa, 2-glandulosa, basi denudata, anthera brevis, obtusa, horizontalis. Pollinia typica.

Plant terrestrial, comparatively slender, 25 cm. high. Leaf solitary, linear, channelled. Stem-bracts 2, 7-7½ cm. long, subulate. Flowers 2, actinomorphic, segments more reddish than green, on long, slender, crimson pedicels, each with a subulate bract below, varying in length from 2 to 4 cm. long, the uppermost bract containing a rudimentary bud. Ovary narrow, elongated. Perianth segments, conspicuously veined. Dorsal sepal broadly ovate, cucullate, concave, tip acute, 1½ cm. long, 9 mm. wide. Lateral sepals ovate, lanceolate, widely divergent, 13 mm. long, 4½ mm. wide. Petals widely spread, about as wide as the lateral sepals, ovate falcate, concave, very prominently veined, 7 mm. long. Labellum 13 mm. long, 8 mm. wide, sessile, base rectangular, 3 mm. wide, callus part somewhat orbicular; posterior margins curled below. The base and the wide portion of the lamina, to the margins (except a narrow central strip), somewhat thickly covered with very short, sessile, purplish glands or calli. The forward, almost tubular part of the labellum, devoid of calli; contracting gradually, and eventually to an acute point, longitudinally veined. Reverse side of labellum smooth, glabrous, spotted with the reddish bases of the glands, and the forward part correspondingly veined. Column erect, 4 mm. long. Wings inconspicuous, connected by a purplish ridge, forward part conical, a purplish gland on each side of the inner margin. Basal part high and smooth. Anther very short, blunt, horizontal. Pollina as in *C. Robertsonii*, etc. Whroo, N.E. Victoria—Mrs. Edith Rich, October 23rd, 1928. Type specimen in the National Herbarium, Melbourne.

The foregoing description is concerned with the largest of three specimens, received from Mrs. Rich, of Rushworth, on October 23rd, 1928. (Each specimen had two flowers, also a rudimentary bud.) They were collected in the vicinity of Whroo, a small township, situated approximately five miles south from Rushworth.

This plant now brings the total of recorded species in this genus to eight—*C. Robertsonii*, Benth; *C. paludosus*, R. Br.; *C. campestris*, R. Br.; *C. cupreus*, Rogers; *C. Holtzei*, F.v.M.; *C. Neo-Caledonicum*, Schl., and *C. imberbis*, Rogers. With but one exception [*C. imberbis*], they have bearded labella. Schlechter's species was discovered in New Caledonia, the others in Australia, two of them extending to New Zealand. This new and unique species differs from all others in a remarkable manner—the labellum is semi-bearded, i.e., two-thirds of the entire surface is covered, somewhat thickly, with very short and sessile minute glands or calli; the other one-third is glabrous.

I have named this new species after Mrs. Rich, who, in 1923, discovered another remarkable species of the same family—the Beardless Calochilus, *C. imberbis*, Rogers. Therefore, it is only right that the name of the finder of two such important contributions to Victorian *Orchidaceae* should be attached to one or other of them.

CALOCHILUS RICHII. N.SP. '

- a. A typical specimen.
- b. A flower, from above.
- c. Labellum, from front.
- d. Labellum, from below.
- e. Calli. from margin of Labellum.
- f. Calli. from Labellum.
- g. Apex of Labellum, flattened out.
- h. Column, from front.
- i. Column, from side.
- k. Sepals and petals.

a. and b. approx. two-thirds natural size. Other figures enlarged variously.

Owing to the resignations of Messrs. E. E. Pescott, F.L.S., and Chas. Barrett C.M.Z.S., as representatives of the Field Naturalists' Club on the Victorian Advisory Council for Fauna and Flora, the Committee has nominated Messrs. Chas. Daley, B.A., F.L.S., and A. T. Latham to act in their stead, with Messrs. A. E. Keep and L. L. Hodgson as substitute delegates.

In response to an application made to the Forests' Commission of Victoria for the appointment of members of the Field Naturalists' Club as Honorary Forest Officers, the Commission has intimated that it is agreeable to consider the nomination of three members of the Club to act in this capacity. The Committee has accordingly nominated Messrs. P. R. H. St. John, Chas. Barrett C.M.Z.S., and V. H. Miller in this connection.

Plate IX.



Calochilus Richii, N.Sp.

A NEW SPECIES OF ORCHID.

CALADENTIA HILDAE, n.sp.

By E. E. PESCOFF, F.I.S., AND W. H. NICHOLLS.

Planta terrestris, gracilis, circiter 15 cm. alta. Folium circiter 12 cm. longum, anguste, lineare, hirsutum. Flores 1 vel 2, lutei et badii. Ovarium densissime-hirsutum. Pedicellum gracillimum hirsutum, circa 6mm. longum. Sepala lateralalia et sepalum-dorsale, subæqualia, circiter 11 mm. longa, $3\frac{1}{2}$ mm. lata, glandulosa. Petala et sepala lateralalia, patentia, pendula, falcato-lanceolata. Petala circiter, 10 mm. longa, 2 mm. lata. Sepalum dorsale, erectum, incurvum, concavum. Labellum sessile, album, obscure tri-lobatum; basi angustum; marginibus lateralibus, fimbriatis; apice dilatato, acuto, purpureo, glanduloso; marginibus denticulatis vel crenulatis. Calli quadriseriati, robustiusculi, teretes vel granularii, variabiles. Columna incurva, circiter 6mm. longa, sub-robusta, purpureo-lineata. Anthera abrupte-acuta. Stigma orbiculare.

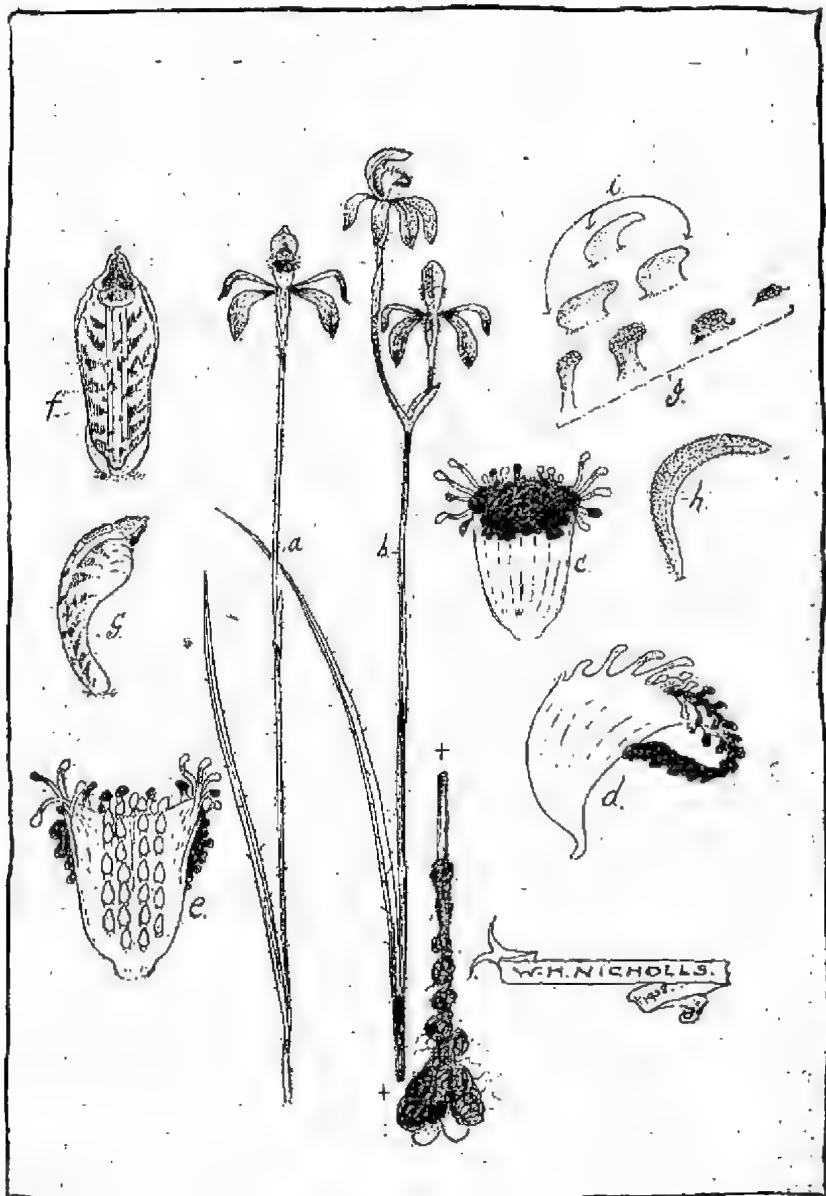
Plant slender, about 15 cm. high, a small, acute bract not quite at the middle of the stem; the stem, bracts, ovary, sepals and petals covered somewhat thickly with brownish, glandular hairs. Leaf about 12 cm. long, narrow linear, sparsely hirsute.

Flowers 1-2, on slender pedicels, each with a small, acute bract below the ovary; ovary about 6 mm. long, slender.

Sepals and petals spreading, *pendant*, falcato-lanceolate, *yellowish brown or golden bronze, pink at base*, covered with brownish glands on both sides, except at the inner half of the upper surface; the whole appearance suggesting a *light coppery or bronze* hue.

Lateral sepals 11 mm. long, $3\frac{1}{2}$ mm. wide; lateral petals 10 mm. long, 2 mm. wide. Dorsal sepal erect, then incurved, concave, forming a graceful hood 7 mm. high, almost hiding the column, which is somewhat *stout*, 6 mm. long, and irregularly banded with reddish or purplish-crimson transverse markings.

Labellum white, sessile, erect at base, narrow, hardly tripartite. Basal margins entire, lateral lobes represented by long, slender white or yellow-tipped calli, *forward part conspicuously glandular*, wholly dark purple, recurving towards the tip. Calli in 4 rows, very short and stout, white, *smooth-marble-like, occasionally anvil-shaped, forward calli very variable*, purplish, *granular-headed*, becoming obsolete towards the tip, where the margins are denticulate or crenulate, tip somewhat acute.



Caladenia Hildae, n.sp.

At first appearance, this species suggests *Caladenia iridescens*, but in *C. iridescens* the colour is very variable, ranging from almost white, through light purple to a rich golden red iridescent hue. In the new species, the contrasting colours appear to be constant, and morphologically there is little resemblance between the two.

The new species comes nearest to *C. praecox* Nicholls, and to *C. testacea*, R. Br., but differs from both in the character of the calli, the shape of the labellum, the drooping habit of the sepals and petals, and the colour of the flowers. The flowering period, too (December), is much later.

The species is named in honour of Mrs. Hilda Elliott, wife of Senator R. D. Elliott, who was able to obtain a grant of money to enable the Club to carry out researches in this State.

The type is in the National Herbarium, Melbourne. The new species was collected in 1927 at Cobungra, in the N.E. of Victoria, by Mr. H. Morgan, who forwarded specimens to Mr. H. B. Williamson, F.L.S. In December, 1928, Mr. Williamson visited Cobungra, and collected fresh material, from which the above description is made.

KEY TO PLATE.

CALADENIA HILDÆ, n.sp.

- a.b. Typical specimens
- c. Labellum from front.
- d. Labellum from side.
- e. Labellum from above.
- f. Column from front.
- g. Column from side.
- h. Dorsal sepal from side.
- i. Calli, smooth types.
- j. Calli, granular types.

REPRINTS.

The Committee of the Club has decided that, in future owing to the high cost of printing, reprints of articles appearing in the *Victorian Naturalist* will not be made available, free, to contributors, except in the case of descriptions of new species, etc., and then only after due consideration has been given by the Committee in each case. Contributors desiring free reprints in connection with scientific articles, should indicate the fact when submitting their contributions, in order that same may be considered by the Committee. This does not of course affect the right of contributors to obtain reprints, the cost of which they are prepared to defray.

VICTORIAN EMBIARIA.

By JANET W. RAFF, M.Sc., F.E.S.

The object of this paper is to place on record for Victoria unidentified species of insects belonging to the Order EMBIARIA, popularly known as web-spinners. These are dark-colored insects, averaging half an inch in length, living in silken tunnels beneath bark or stones. There appears to be no previous record of Victorian species. Last August I collected two wingless females from beneath the bark of trees, one at Studley Park, Kew, and the other at Olinda.

The order is a small one, and only four species have, so far, been described from Australia, viz: *Oligotoma hardyi* Imms, and *O. glauerti* Till., both from Western Australia, and described from the males only; and *O. gurneyi* Frogg. and *O. agilis* Frogg., from New South Wales. The latter species is quoted as *gracilis* in Tillyard's *Insects of Australia and New Zealand*, but this is obviously a misprint for *agilis*. An undescribed species from Queensland, and another from Tasmania, are also recorded by Dr. Tillyard.

Mr. G. F. Hill, Assistant Chief Entomologist, C.S.I.R., has from time to time, collected specimens at Lower Tarwin (Gippsland), Warrandyte, Kew, and Hawthorn; and Mr. J. Clark, F.L.S., Entomologist, National Museum, has, in his office at the present time (December, 1928) living specimens, which were collected by Mr. C. French, jun., near Mildura.

The most striking features of the order are the expanded tarsal joint of the forelegs, in which is said to be the gland which secretes silk for the tunnels, and the wingless condition of the female. The position of this silk-gland is unique, since in all other insects, silk is spun either at the mouth or at the hinder end of the body. Thus, in lepidopterous larvae, the silk-glands are modified salivary glands, with the duct opening at the mouth on the spinneret; and in ant-lion and aphid-lion larvae, it is the excretory organs (malpighian tubes) that have become modified, secreting silk through the anus.

I regret that I did not, at the time of my "catch," examine in detail the shape of the silken nest or tunnel, but this I hope to do at a subsequent opportunity. My recollection is that the nest was composed of a closely-matted cob-webby material, and was, roughly, oval in shape, one to one and a half inches in length, and open at one end; the insect, on being disturbed, slid quickly backwards to shelter, beneath its "web."

A very interesting account of the biology of an Indian species of Embiaria (*Embiu major* Imms) is given in a paper

by Dr. A. D. Imms (*Trans. Linn. Soc., London*, Vol. 11, 1913). Photographs and sketches of nests are there reproduced, showing branching and interlacing series of tunnels, with, in some cases, underground chambers communicating with the silken tunnels. The nests varied in size, depending largely on the number of individuals living therein; one nest containing four females and one male measured one foot four inches in length, and another containing a single female only, measured eleven and a quarter inches. The largest number of individuals found in any one nest was 21.

Other points of interest brought out in Dr. Imms' paper are the association of the *Embia* with termites, the two species of insects appearing "to be on perfectly amicable terms with one another, resembling symbiosis," and also the fact that the females exercise maternal care over their eggs and young, just as has been described among Earwigs.

Classification and description of species of *Embiaria* appears to be based largely on the terminal abdominal segments of the male, and on the wing venation, therefore new species should not be formed on females only. I hope, at a later date, to be able to observe the habits of our local forms, and to provide notes on the subject.

ORCHIDS IN THE DANDENONGS.

While searching for orchids during December, in the comparatively less-frequented parts of the forest lands, from Tocoma to Sherbrooke, thence through Ferny Creek westerly to Ferntree Gully, we found *Pterostylis decurva* Rogers, *Microtis porrifolia* Spreng and *Gastrodia resamoides*, R.Br., in fair numbers. One specimen of *M. porrifolia* was growing in red volcanic soil, on a hillside, with little shelter from the sun. It was 3 feet 8 inches in height, the leaf exceeding the inflorescence by 15 inches.

In a gully, where tree-fern croziers are of sturdy growth, we saw *Sarcocilus parviflorus* Lindl in its glory—exceedingly plentiful—on *Sassafras*, *Pittosporum*, and Blanket-leaf trees. Here and there, far beyond reach, plants were clustered together, with numerous hanging racemes of butterfly-like flowers. One unusually large specimen, within easy reach, had two racemes of 15 and 10 flowers respectively. There were hundreds of plants hereabouts, all showing from one to three racemes.

We completed a pleasant ramble by descending to Ferntree Gully. On the way a male Lyre-bird was seen ascending, by short flying leaps, to the uppermost branches of a tall Blackwood tree. Our near approach evidently disturbed him, as, suddenly he launched himself, with wings and tail outstretched, from a great height, plumed, in full view, across the gully, beyond our sight.

W. H. NICHOLLS.

STUDIES OF AUSTRALIAN BEES.

THE RED BEES.

By TARTLTON RAYMENT.

Permit me to tell you about the red-bodied bees, whose habitat extends from Queensland right down into Tasmania. I do not find them near the coast-line, but a few miles inland, especially among the hills they occur in abundance.

You must not be disappointed when many red bees in your collection are determined as *Parasphcodes*, and not *Binghamiella*; indeed, the former are very numerous, and for many years the latter were known by Fred Smith's name, *Sphcodes antipodes*, or else by the synonym of Sichel, *Santipus*. You see, these nomenclators overlooked a few features; consequently, when Bingham obtained a few specimens, he promptly pointed out to Professor Cockerell that these red bees had no affinity to the *Sphcodes*, nor did they show any relationship to the Australian *Parasphcodes*. Dr. Cockerell observed the short, wide tongue, that is possessed by all Prosopoid bees, placed them in the PROSOPIDIDÆ, and created the genus *Binghamiella*. The Tasmanian form is known as the sub-species *B. antipodes insularis* Ckil.

But the likeness to *Parasphcodes* is very marked, and one may be pardoned for failure to distinguish the differences, for both have a black head and thorax, and are somewhat similar in stature. A lens will help you to discern certain prominences or nodules at the sides of the metathorax of *Binghamiella*, a character which is never observed on the *Parasphcodes*. The keen observer will see, too, the coarse, deep puncturing of the head and thorax. These points are sufficient. I think to permit of your successful introduction to them.

To study the red bees one must capture a specimen or two. The nearest point to Melbourne where I have found them is at Box Hill, and about the hills of Ferntree Gully they are plentiful enough during February, March and April, though, to be quite truthful, I have never surprised one on a flower. I know not when or whence they emerge from their natal cradles, but males are about in February, and females are arriving right into the beginning of April. We can assume, then, that the mating time is during the early part of the year.

I seldom look about grasses for bees; they offer so little attraction to such inveterate lovers of honey and pollen but an exception must be made of the *Binghamiella*, for grasses are the only plants on which I have collected them. I am not alone in this, for my friend, Clarence Borch, collected some males from the tips of the Kangaroo or Wallaby grass. Strange to say, all the specimens have been caught on cold, windy and rainy days, the male bees hanging miserably in groups of 30 or 20, about the tips of the grass stalks. Both males and females have been observed in such inhospitable positions, though the latter are found singly.

Now, where are the nests? Frankly, I am writing this with the object of invoking the aid of all my fellow-members of the

Field Naturalists' Club during the coming summer. I have often found the nesting places of bees simply by reasoning from the anatomy of the creatures, and in this case I am going to outline where one should look, and why one should seek. In short, I shall write something that sometimes recoils on the author, yet I have often proved the value of the proceeding, and the risk is small. Oh, yes, I remember Fabre's warning, but I also recollect Darwin's prophecy regarding a moth.

The nest is a tube or gallery made originally by some other insect; the *Binghamiella* does not bore for itself. How do I know that? Well, the calcaria, or tibial spurs, of all earth-digging bees have one or more coarse teeth. The spines of this red bee are only finely serrated, like those of all other bees which nest in a second-hand home.

Because of the shape of the mandibles, or jaws, I venture to suggest that the tube will be found in wood, probably the abandoned gallery of a longicorn beetle. Had the jaw of the female been more acute, then I should have said "a shaft in the ground." At the bottom of the shaft there will be a cradle-lining of fine, silvery, skin-tissue, shaped somewhat like a "derapitated" hen's egg about 4 mm. in diameter and 8-9 mm. in length. Reason: The short, wide "tongue" of the "obtusiformes" (Westwood) denotes the weaving of fine coverings; the cells, therefore, are lined with tissue. The shape of the organ tells me that she is an industrious, and not a parasite, species, for all the latter have pointed tongues.

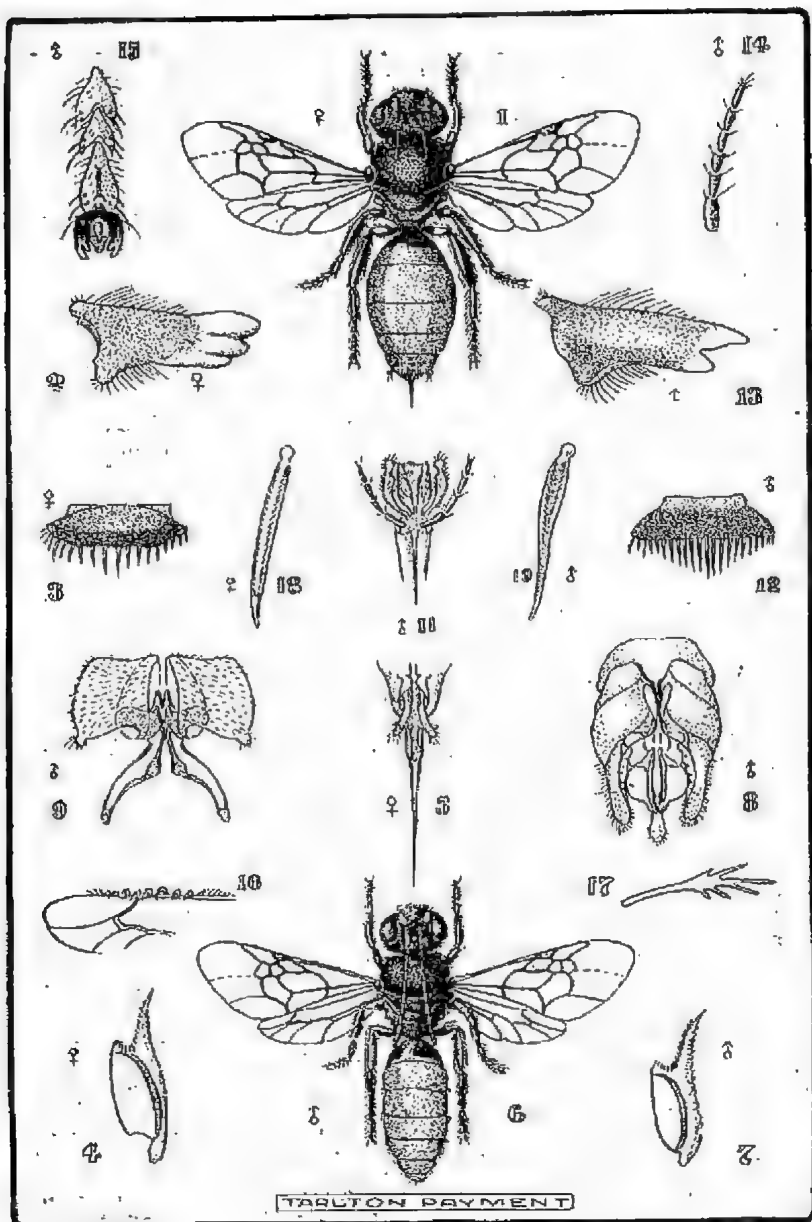
The nectar-sac, tongue, anterior legs and hairs of the creature assure me that pollen is swept up into the mouth with the fore-legs, and is swallowed and allowed to mix with the nectar; therefore the stores for the baby bees will be a thick batter placed in the bottom of the cell.

How many cells are in the tube? From two to six. Microscopical examination of the ovarian tubules reveals a limited capacity for egg production; no large family is possible.

The nest is not very far from where the bees are caught. I know this, because the hamuli, or wing-hooklets, are ill-formed and few in number. All the strong-flying bees have numerous, regular and beautifully-formed hamuli. It is plain to me that great or continued speed demands perfect co-ordination of the anterior and posterior wings; small, ill-shaped hooklets do not give efficient contact.

What is the order of the generations? Now I find myself stripped of all aid except what little I am able to deduce from the ovaries of the mother. Males and females emerge together in early summer; only one generation emerges each season; the couples mate during February; the fecundated females construct and provision the cradles and die off during late autumn; the baby bees are carried over the winter in larval form, and emerge during the succeeding late spring.

This is not pure conjecture; I have given a life-history built up solely from the anatomy of the creatures. I know I am not very wide of the truth, but I invite you to check my statements by your observations in the field.



KEY TO ILLUSTRATIONS, PAGE 242.

1. Adult female *B. antipodes* Smith.
2. Mandible of female.
3. Labrum of female.
4. Antenna-cleaner of female.
5. Sting extruded and showing small palpi.
6. Adult male, *B. antipodes* Smith.
7. Antenna-cleaner of male.
8. Genitalia.
9. Membrane that lies over genitalia.
10. Spur of male.
11. Glossa and labial palpi of male.
12. Labrum or lip of male.
13. Mandible of male.
14. Maxillary palpus of male.
15. Tarsal joints of leg.
16. The miserable wing hooklets or hamuli.
17. Forked hair from leg of female.
18. Hind spur of female.

EAGLES AND WALLABIES.

The Editor, the "Victorian Naturalist," Melbourne.

Dear Sir,—

In the June number of the "Naturalist," Mrs. V. H. Miller, writing of the Wedge-tailed Eagle, deplores that, in the bird section of the Perth Museum, a Wedge-tailed Eagle is suspended from the roof, holding in its talons a young Wallaby.

May I be permitted to state that the exhibit, illustrating the lifting power of the Eagle, is based upon personal observation! Some fifteen or sixteen years ago, whilst in the vicinity of the Calgardup Cave, Margaret River, in the extreme south-west of this State, I surprised an Eagle which had captured a Wallaby, *Macropus brachyurus*. On my approach the bird flew to a tree near by, but dropped its prey when I fired a 410 collecting gun. Investigation showed that the Wallaby was lying at the foot of the tree, apparently unharmed, and none the worse for its experience.

The museum taxidermist, Mr. O. H. Lipfert, found remains of another species of Wallaby, *Bettongia leucurus*, in a Wedge-tailed Eagle's nest on Dorre Island, Shark Bay, whilst he was collecting there for the Museum in 1910. Both these species would weigh as much as a new-born lamb. During a visit to Milly-Milly Station, on the Murchison River, in 1922, I saw a number of Eagles' nests in low trees, and most of them were surrounded by a litter of bones, etc., amongst which were the remains of birds, rabbits and young Kangaroos, distinctly larger and heavier than the two Wallabies referred to above.

Yours faithfully,

L. GLAUERT,

Curator of the Museum.

Perth. December 12, 1928.

KOONUNGA CURSOR: A UNIQUE CRUSTACEAN.

By J. SEARLE.

It was with feelings of extreme regret for the vanished beauties of Ringwood, as I used to know it, that I returned from a visit to that—from a naturalist's point of view—historic spot.

About twenty years ago, our late fellow-member, Mr. O. A. Sayce, described a very remarkable little crustacean, taken in Koonunga Creek, Ringwood—remarkable in many ways. It belongs to the order Anaspidacea, comprising three genera, each with a single species. Two of these are found only in Tasmania, while the third, *Koonunga*, has never been recorded outside Victoria.

The Anaspidacea are the only living representatives of the Syncarida, closely related to fossil crustacea found in the Palaeozoic rocks from the coal-measures of Derbyshire. Another remarkable feature of *Koonunga cursor* is that its eyes are sessile, while the other two genera have stalked eyes.

With the march of time, the population of Ringwood has increased, so that the type locality of *Koonunga cursor* is now built over, and the little stream in which once it was so abundant is now converted into a drain for the storm-water of the town, and, incidentally, the sewage of the surrounding dwellings, with the result that a whole day's search failed to discover even one specimen of *Koonunga cursor*. That it still exists in the higher reaches of Koonunga Creek—above the contaminated portion—is possible, and it would be well if a systematic search were made to see if this is so.

The fact that the little stream, fed by the rains that fell on the adjacent hills, in which *Koonunga* used to thrive, at times of drought dried up completely (and another fact, to be mentioned presently), points to the conclusion that the eggs of *Koonunga cursor* retain their vitality through these periods, and could be carried by the wind to other localities—perhaps into the dams in the neighbouring paddocks. That this is quite possible is shown from the fact that in a dam at Portland, 200 miles from Ringwood—which dries up every summer—*Koonunga cursor* are to be found.

In a small creek in Gippsland, between Nyora and Lang Lang, I once took a specimen of *Koonunga*, but was not aware of the fact until I returned home, and found the specimen running around the bottom of the collecting bottle. If *Koonunga* can be found in such widely separated places as Nyora and Portland, surely it must exist in some of the water-courses or swamps between, and it behoves our "pond-hunters" carefully to search for the occurrence of this unique little crustacean.

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THE FIELD NATURALISTS' CLUB OF VICTORIA.

The ordinary monthly meeting of the Club was held in the Royal Society's Hall on Monday, January 14th, 1929. The President (Mr. F. E. Wilson, F.E.S.) occupied the chair, and there were about 100 members and visitors present.

CORRESPONDENCE.

From Senator R. D. Elliott, thanking members for their congratulations on his election to the Senate.

From Mount Dandenong Reserves Committee, advising in regard to the establishment of a National Arboretum at Kalorama (Mount Dandenong North), and requesting the support of the Club.

The Hon. Secretary announced that the Committee had approved of the establishment of the Arboretum, and had indicated that the Club would support the project.

REPORT.

A report on the excursion from Nyora to Lang Lang was given by Mr. H. B. Williamson, F.L.S.

ELECTION OF MEMBERS.

The following were duly elected on a show of hands:—As Ordinary Member: Miss Lenore Ridgway, South Yarra; and, as Country Member: Miss Jean Sanger, Corowa, N.S.W.

GENERAL.

The President announced that nothing further had taken place in regard to the proposal to reserve the Cumberland Valley as a National Memorial Park, but that the Minister of Forests intended visiting the area later in the week, and it was expected he would then receive a deputation on the matter.

The President referred to the Historical Exhibition, which was to be held in Melbourne in May next, and stated that it was hoped to arrange an exhibition of aboriginal art at the National Museum.

Attention was drawn by the President to the donation by Sir Baldwin Spencer of a copy of his book, "Wanderings in Wild Australia," to the Club Library. Mr. G. Coghill moved that the thanks of the Club be conveyed to Sir Baldwin

Spencer. Mr. A. E. Rodda seconded the motion, which was carried.

The President welcomed Mr. T. S. Hart, of Bairnsdale, an old member of the Club, and also Mr. Tarlton Rayment, who had recently recovered from a severe illness.

NATURAL HISTORY NOTES.

Mr. L. L. Hodgson gave a short account of a pair of Sacred Kingfishers, which had nested and hatched out a brood in the Fitzroy Gardens. Mr. H. B. Williamson referred to the large size of some "Fairy Rings"—caused by a fungus growth--which he had recently observed.

PAPERS, &C.

Mr. C. Daley, B.A., F.L.S., read an interesting paper, entitled "Natural History Notes on the Federal Capital Territory," in which he dealt with the physical and geological features of the district, and referred to the various plants, birds and other animals observed during a recent visit.

EXHIBITS.

By Mr. C. Daley, B.A., F.L.S.—Dried specimens of *Dodonaea viscosa*, *Veronica perfoliata*, *Hibbertia linearis*, *Pultenaea styphelioides*, *Hakea sericea*, *Grevillea pumila*, *G. juniperina*, *Mirbelia oxylobioides*, *Plagianthus pulchellus*, *Daviesia corymbosa*, *Astrotrichalepis*, *Pomaderris elliptica*, *Kunzea peduncularis*, *Adriana quadripartita*, and *Clematis aristata*; also sections of bark of *Eucalyptus coriacea* (White Sallee) from Federal Capital Territory, and chipped stones and broken axe from Molonglo River (F.C. Territory).

By Mr. J. Searle.—Specimen of *Koomunga cursor*, under microscope.

By Mrs. E. S. Hanks.—Specimen of Hyacinth Orchid, *Dipodium punctatum*, collected at Wandin.

By Mr. J. Wilcox.—Specimen of N.S.W. Christmas Bush, *Ceratopetalum gummiiferum*, cultivated at Camberwell.

By Mr. G. Coghill.—Specimen of Horned Orchid, *Orthoceras strictum*, from St. Helens, Tasmania.

By Mr. H. P. McColl.—(a) Hornet's nest on emery-cloth; (b) Quandongs, *Eucarya acuminata*, from Forbes, N.S.W.; (c) cultivated specimen of Kanooka, *Tristania laurina*.

By Mr. C. Borch.—Specimen of the Green Swallow-tail, *Papilio macleayanus*, from Belgrave. This species is more numerous this year than usual. Also seven species of moths, obtained at Kiata, Western Victoria, including *Porela notabilis*, *P. galactoides*, *Perna exposita*, *Entometa sobria*, *Creza acedesta* and *Danina banksii*—all bred from cocoons.

By H. B. Williamson, F.L.S.—Dried specimens of *Caladenia Hildae*, Pescott and Nicholls, an orchid recently described; *Hakea microcarpa*, R. Br.; *Discaria australis*, Hk. f.; two very distinct forms, one being from a shrub over 10 feet in height, with well developed leaves and no spines; *Carex rara*, Boott, a sedge not previously collected in Victoria; *Carex stellulata*, Good., for comparison; all collected by the exhibitor at Cobungra, December, 1928. *Callitris verrucosa*, R.Br.; fruiting specimen, a foot in height, from Murrayville, collected by exhibitor. Photographs, by Mr. Edgar Ellis, of Greta, showing a remarkable example of fasciation in *Carduus lanceolatus*—plant with a flattened stem a foot in width.

By Mr. T. S. Hart, M.A.—Berries of Scrambling Lily, *Geitonoplesium cymosum*, from a cultivated plant. Specimens in formalin of *Prasophyllum Hartii*, Rogers, and *P*— (a doubtful species), both from Bairnsdale, flowering early in November. Spike of *Prasophyllum*, with two flowers abnormal, showing double labella. Flowers of *Corysanthes fimbriata*, from Bairnsdale, collected June, 1928.

EXCURSION, NYORA TO LANG LANG.

A small party met at the Railway Station, Nyora, on December 15, and, favoured with very fine weather, walked along the railway to Lang Lang, a distance of $3\frac{1}{2}$ miles, noting many plants in flower and examining the ponds on the way for aquatic life. The most interesting of the former were *Patersonia longiscapa*, *Hibbertia procumbens*, *H. acicularis*, *Thysanotus tuberosus*, the last-named, Fringe Lily, being specially fine. The Austral Leek-orchid, *Prasophyllum australe*, also, about two feet high and in good bloom, was found in abundance.

It was with some surprise that a patch of the introduced pest, *Hypericum perforatum*, St. John's Wort, was met with so near to the city. These plants were growing in the vicinity of the $50\frac{1}{2}$ -mile post, among the native vegetation inside the railway enclosure, and even on the ballast. Acting on the advice of the committee of the Club, the Council for Scientific and Industrial Research was notified of the existence of the weed near Melbourne, and it is probable that Dr. Tillyard will use the locality as a field of research into the methods of eradication by the agency of insects.

The ponds examined gave unsatisfactory results, as many were almost dry, and others had been interfered with by railway men, and contained little vegetation. The samples submitted to Mr. J. Searle were "remarkable for the total absence of crustacea. The most conspicuous microscopical organism was *Actinospherium eichornii*, very large and in great numbers. Macroscopic life consisted of Dragon-fly larvae, *Chironomus* larvae, a few small beetles, *Notanecta*, *Corixa*, and tadpoles."

H. B. WILLIAMSON.

PYGOPUS, THE MUD-DWELLER.

BY (MRS.) E. H. LINTON.

Among the many strange denizens of an open, but warm-lying, marsh, is the *Pygopus lepidopus*, the *Bipes* of Cuvier, the "slow worm" or "grass snake" of the bushman, and the martyr of the legend that a burnt snake will show its legs. Strange, unsuspected, and seldom seen, its habitat is in marshy ferns, and its dwelling made close to standing water. Here, inside the orifice of a tubular burrow, the intent gaze of a motionless observer may espy the gleam of a rounded, glistening muzzle, or occasionally catch the flicker of a momentarily protruded tongue—a quill-like member, with thickened tip, that shows, as in other lizards, between parted jaws.

Keep still, and, although he is well aware of you, his slender, shining body will smoothly glide, with the beautiful fluent movement of the snake, out from the hole and to a sunlit spot, there to luxuriate at full length, the while a round eye, level-topped as the eagle's, watches you from an obliquely-held head. The scar-like, indented opening of the ear, which is, as in *Lygosoma*, so far behind the cheek, appears to widen and contract with pulsing throbs. Sensitively alert, the *Pygopus* is ruminating speculatively as to your probable business, the while he watches you with unabated keenness.

So clean, so shining is the lithe and graceful body, although it works through boggy soil or muddy gravel in search of prey, there is no speck nor foulness of mud or slime on its glistening scales.

Very little larger than our Whipsnake, or about 24 inches in length, its body has something of the peculiarity of its tribe, in being slightly different in contour from the tail—an immensely long tail in comparison with the body, longer than it by two-thirds, and of a perfectly cylindrical form, tapering finely to its pointed extremity, slightly constricted at junction with body, beneath the tiny, tapering fins. The body has the lizard's flatness of dorsal surface, with slight bulging of corpulent sides.

It is a beautiful little creature, with a silvery glitter playing over its body as it ripples into movement. Seven longitudinal stripes of black enamel, thread through white-edged oblongs, and run in lacquered ribbons from cephalic plates to within an inch of the tail's extremity. The apparently netted surface they rest on is of a polished steely-grey, gleaming with lavender, that flashes in metallic lustre into shades so rich, it is almost blue. The tongue, when protruded slightly between slightly-opened lips, is contracted to a blunt-ended quill. Constantly it slips out, and in so doing wipes the labial

and rostral plates, or, shooting higher, dabs the nasal ones, and runs over nostrils. It is as swiftly withdrawn as it is flicked out. As with *Tilapia*, the tongue stretches in the widely-opened mouth to a thin, fine membrane, with margins delicately tinted blue. It is set as in the human mouth, and extends at base from side to side. It is shallowly notched at the rounded tip, smooth on posterior part, and the anterior roughened with minute scales.

At the veritable extremity of the body, placed laterally, with distal extremities posteriorly directed, are the two fin-like appendages, scientifically alluded to as either rudimentary or atrophying limbs; but rather they appear to be adaptations of vestigial bones—not degenerate, but specialised, and for a singular purpose, paralleled only in the insect and molluscan world. By dissection may be found minute leg-bones—a femur and tibia—and also bones of the meta-tarsus, forming toes, but without phalanges; sufficient, in fact, to give an extension, or surface to work over, of locomotor muscles—their use in this respect being a helpful leverage on a too-level or smooth surface. But chiefly are they specialised for another and peculiar function, namely, the spreading and pressing of a viscous fluid, wherewith are rendered adhesive the earthen sides and ceiling of the tunnel and egg-chamber.

Exteriorly, these diminutive limbs appear only as two small, oblong, scale-covered paddles, somewhat stiffly held away from the body at the base, but rather limply dependent at their rounded extremity. At their base, and extending in a semi-circular fashion until they join crescentrically beneath the body, are large, variously-shaped sentae, between which and the ordinary ventral plates is an arched row of glandular orifices, usually level with the scales. These pore-like openings caused us to wonder had they a respiratory purpose, or at least were absorbent of air, as in the frog's smooth, moist skin. But closer observance convinces us that they are the official rims of ducts which contain and convey a secretion, akin, in use and object, to the mucosid film with which certain insects and molluscs plaster their nest-sites, or glue their bodies to chosen stations. They are, in fact, mucous crypts with muscular walls, and are slightly projected whilst the viscid fluid oozes. The secretion agglutinates the sand or peat, rendering it adhesive, and is worked or pressed into it to a certain depth; another application makes a smooth, filmy layer, and the inner surface of the tubular tunnel hardens to a fixed symmetrical casing.

The long tail, one conjectures, is of use in the tunneling, if only as a filling or mould, while boggy earth or sand becomes firm and set. It is also an effective instrument in propulsion

and in climbing, and a flexible, easily-adjustable stay or brake in descending. It is an excellent refutation of the theory that unnecessary members gradually dwindle by atrophy; it may be cast off by its terrified owner four or five times in as many seasons, thereby appearing to indicate that its use is as easily dispensed with as itself. But it is renewed as often, and in the following season is again a perfect, though rather shortened, member, with broken patterns on its smaller scales and definable scars on the new junction.

So small are the teeth, so fine and transparent, that they are scarcely to be seen. Their use, as in most lizards, would appear to be chiefly for holding food during a meal. The mud-dweller's mode of progression is physically that of the snakes—by the movements of ribs, muscles and scales—but it has also a molluscan habit of drawing itself to an object of which it has taken hold with its mouth. In such a way it also holds to an obstructing rootlet, a salivary discharge apparently softening the slender obstacle, so that in a little time it yields to the curious back-and-fore rubbing between the jaws. On a smooth or level surface, the paddles, turning outward in oar-blade fashion, hitch by their edges, or against some slight irregularity, and such leverage gives just the fraction of propulsion the animal needs.

The female *Pygopus* is shorter in actual length than the male. Her tail is shorter, comparatively, and is not so constricted at the base beneath the paddles. The eye appears to be larger and rounder, but this is because the plates above the orbit rise more circularly, and are not so beetling as they are in the male. The colouring, it would appear, varies in either sex. In those of my acquaintance, the male is far brighter in usual appearance, and much more variegated in colours. The female is more uniformly coloured, of a yellowish-brown, with less-continuous streaks of black, that have no white on the margins. Beneath, she is of a silvery-grey, which in spring is tinted pink. But I have seen others, in which the male has the brown and grey preponderating—more gold in the brown, but hardly any black. I suspect it had not attained to adulthood. And I have seen a female almost as handsomely marked and shaded as my especial friend, but whether this was due to age or environment, I cannot say.

Pygopus begins her tubular cell with a circular orifice, so small, it is not easily perceived. This beginning is obliquely downward. Beyond that point it curves, turns upward, and then becomes horizontal. The nature of the soil influences the regularity of the walls and straightness of the passage, root or stone causing a deviation, for rarely, in the construction of the passage to the egg-chamber, does she delve below or

above an obstruction. The passage is brought up pretty steeply to the small, round depression where the eggs are to be deposited, which is also the terminus, and it ends below the sun-facing side of wood or stone, or grass tussock.

It is wonderful that a smooth bodied, limbless reptile can bore and excavate and make smooth and firm a finger-wide tunnel, 30 or 40 inches in length, in moist, peaty earth, rendered crumbly by sharp sand. When one examines the tiny paddles that have apparently little more substance than an empty glove finger-tip, or looks at the close-fitting scales, of which all except the carinated centres of the dorsal ones are so thin as to be almost membranaceous, it is marvellous that hard substances can be dislodged, softened, by a perhaps solvent humour (as in the lithophagus mollusc, or the worm which lodges in stone), and worked into a tubular channel. But horizontally, as the road-maker's shovel is used, the slim body follows the boring nose, and the cavity, a little larger than the orifice, is carried, at a depth of perhaps two inches below the surface, to its termination.

It is impossible, of course, actually to see the work in course of construction, but I am of opinion that many of the curious movements made during its toilet are repeated in the smoothing of walls and ceiling, particularly in the hollowing of the nest-chamber or the plastering of the ceiling—lateral pressures that widen; vertical curves, in which the anterior dorsal part presses against an overhead surface; or the ventral, thoracic part pushes into and hollows the soil, as a bird with her breast in nest-building. In the toilet, the body appears to turn over, re-curling on itself, winding into complicated knots, drawing itself through looped folds, as an earth-worm wipes and clears away the particles of soil adhering to its body. And in some such fashion, we conjecture, the busy little animal works and packs and smooths to a compacted surface, the earthen walls and roof of its passage and cell.

But other borings and tunnelings are performed, as well as those designed for dwelling-place or nursery. Horizontal shovellings and vertical excavations follow up the perforations and drillings of subterranean larvae. Not that such underground dwellers form the lizard's sole sustenance. Marsh slugs and another *Limax* of strange propensity (in that it climbs bushes and small trees, from which it lowers itself to the ground again by a viscid web), spiders, moths, beetles, all contribute to a varied bag. Watch *Pygopus* detect the settling or movement of a hawk-fly, a stone-fly or a crane-fly, or it may be a beetle falls to the ground, or a moth vibrates her amorous message to unseen suitors. All alert, *Pygopus* winds rapidly toward the sighted prey. If it is above him.

or an earthen slope is in interposition, then may be seen the utility of his exceedingly long tail; for up the slope he glides, reared, as it were, on that pliant member; the notched tongue shoots out to wrap the prey, and as swiftly the rounded jaws snap-shut on-it—If fairly balanced, he prepares his food, maintaining his position; but if he has over-reached, he falls, with indifference, to the level, and there begins the slow champing, turning, sucking process, that is the lizard's mode of eating.

I cannot be quite sure, as it has been impossible to determine, that *Pygopus* habitually brings forth eggs or young. Perhaps, as in some snakes, the eggs are retained, and ruptured before extrusion (as in certain of the Diptera). I have found in the egg-chamber tough-skinned capsules, which had curious, scarcely-developed young creatures, adhering, apparently, in a manner resembling those of some cuttle-fish; but I have also found tiny, living creatures, where, a moment before, were none. It is possible that the eggs were in course of rupturing; it is also possible that they belonged to some other animal, as the female *Pygopus* was not in evidence, and the small beings perished. But the slug-like babies belonged indisputably to the *Pygopus*, and grew into her likeness.

NEW AUSTRALIAN BOOKS.

"*Open-air Studies in Australia*," is the title of a new book by Mr. F. Chapman, A.L.S., one of the most distinguished members of our Club. It is a volume of popular scientific essays, chiefly on geological subjects, and a foreword has been contributed by Sir Edgeworth David, K.E.F., who says that no one, since the time of Robert Etheridge, Junr., has more enriched knowledge of the past forms of life in Australia and adjacent regions than has Mr. Chapman, "whose ability is matched to a marvellous industry." We shall all desire to read this book to be published about April next, by Messrs. J. M. Dent and Sons Ltd., London.

Another book announced for publication, in April, by Messrs. Dent and Sons, is "*Birds and Green Places of Australia*," by Alec. C. Chisholm, of Sydney. This will be a finely illustrated volume (86 photographs and two colored plates, from paintings by Neville W. Cayley). Mr. Chisholm is not only noted as a naturalist, he is also one of the best writers of prose in Australia, and he has done much to popularise nature study in several of the States. He is a native of Maryborough, Victoria.

It is encouraging to find one of the great publishing houses of London issuing popular Australian "open-air" books. C.B.

Correction.—"A New Victorian Orchid" (*Victorian Naturalist*, January, 1929): *Calochilus* "*Rickii*" should read *Calochilus Rickae*; "*uratum*," 5th line from top (Latin), should read *acutum*, *lamac*, 4th line from bottom (Latin), should, read *laminac*.

NOTES ON THE SACRED KINGFISHER.

By THOMAS S. LANG (Ivanhoe, Vic.).

During the past season, I enjoyed unusual facilities for observing and photographing the Sacred Kingfisher, *Haleyon sanctus*. Three nests were located within a radius of less than two miles from the Heidelberg-Templestowe bridge over the River Yarra. Two of the nests were in the hollows of willow trees; the other was a hole in the river bank, and, being in every way the most conveniently situated, was chosen for observation. Its discovery was accidental.



SACRED KINGFISHER

Female bird approaching nest with dragon-fly.

We were walking along the bank of the river on December 1st, when suddenly a bird flew almost from under our feet. In a few moments we located the nest. At this particular point there has been a subsidence of the river bank, caused by flood erosion. The nesting-hole was in the vertical "wall" left when the bank gave way. Apparently the opening in the bank was caused primarily by a tree-root. It had been en-

larged by the birds, and a roomy cavity made a few inches from the "face." There was no attempt at the making of a nest, so far as bringing in material was concerned. The eggs were laid on the bare earth, which was not even hollowed out to receive them. When the nest was discovered, the entrance was relatively small. After the young had been hatched, the opening was enlarged considerably.

Our first problem was to ascertain how far the birds had proceeded with the rearing of a brood. We sat down at a convenient spot, and waited. Ere long, an adult bird (which later proved to be the female) appeared and entered the nest. But almost immediately she hurried out. After a further wait of a few minutes, she approached the entrance again, and, after fluttering near it several times, entered once more. This time she stayed. We sat where we were for a further brief space, to allow her to settle, and then quietly withdrew. We noticed, at this stage, that she made a low "chuckling" noise as she approached the nesting-hole, and just as she was about to enter it. I made further examinations on December 8th and 15th respectively, but she was still brooding. I should mention here that, during the time we were making these examinations, we saw nothing whatever of the male. Of course, this may have been merely a coincidence.

On Saturday, December 22nd, we paid a further visit, and were delighted to find that the young were hatched. We examined the nest with the aid of a mirror, and found that the "family" consisted of three most helpless-looking individuals. Apparently they were but a day or two old at this date, as they were featherless, and their eyes were unopened. I assume from this that the period of incubation must have been nearly four weeks. The sole activity of these young birds seemed to be the keeping up of a continuous "squawking." This exercise was performed in turns, one singing a solo, while the others took a spell. When either of the parents arrived with food, they all joined in the chorus (*fortissimo*).

It is remarkable how young birds in a burrow are able to sense the approach of the parents with food. Lodged in a hole in the earth, whence they would have been unable to see, even if at this stage their eyes had been open, and making such an incessant din as to preclude all possibility of their hearing anything going on outside, they yet knew immediately either of the old birds came near. Moreover, the parent birds, at this stage, were very silent, rarely uttering any sound. As the nestlings became older, these vocal exercises changed in tone, and later ceased altogether. For in-

stance, when they were about five or six days old, the sounds, though still incessant, were deeper and stronger than at first. In another four days they were much quieter, while a couple of days later—that is, when they were about twelve days old—the noise had ceased, except when the parents approached with food. In another ten days they were silent all the time, except when handled.

An interesting phase of the investigations was that relating



SACRED KINGFISHER

Nestling about 16 days old. Very helpless and underdeveloped.

to food and feeding. Statements have been made from time to time, implying that the staple article of diet for Kingfishers, old and young, is fish. My observations do not confirm this, so far as the Sacred Kingfisher is concerned. The first food I saw given to these young birds consisted of dragonflies. These were of all sizes. In fact, when the nestlings were only a day or two old, one dragonfly was served up which was too big for them to swallow, so it lay in the entrance to the nest. A large brown spider also had apparently been

rejected for the same reason. Beetles of all sorts—those popularly known as “golden” beetles predominated—were fed to them regularly from the time they were hatched. After a day or two, yabbies and frogs were added to the dietary, while grasshoppers, which by that time had become plentiful, were substituted for dragonflies.

For the first few days the female bird was much more in evidence than the male, but by the end of the second week after the hatching the male was doing the bulk of the work, visiting the nest about twice as frequently as the female. Only once did I see a fish being fed to the nestlings, and that was about four days before they left the nest.

There is a deep pond not far from the nesting site, where frogs, as well as a great variety of aquatic insects, are very plentiful. On one day, I watched the male bird go to and come from this pond many times. In fact, on this particular day he supplied nothing but frogs to the clamant brood. Sometimes he would be away but a few minutes, and would return dripping with water. Again, he would remain away for upwards of half an hour. On one occasion he sat on a nearby tree for about an hour, with a frog in his bill, before he ventured near the nest. On December 22nd, which was the first day on which we attempted to photograph the birds, we were afraid that their shyness would spoil all our hopes.

The female was the first to appear after the camera had been set up. It was a long time before she would venture near. At last she made a swoop towards the nest, but swerved off when within a yard or two of it. Then she perched nearer. After a wait of a minute or two, she flew right into the entrance, but was out again in a twinkling. This happened no fewer than six times before she gave the food to the young. After an hour or two, this shyness seemed to wear off to some extent, and the obtaining of good exposures was much simplified.

I have already mentioned the comparative silence of the adult birds during the first few days after the brood was hatched. During the second week, there was a decided change. They would sit on a branch of an adjacent tree, with food in their bills, and give a “crooning” call—not loud, but rather melodious—a call one would hardly expect to hear. Sometimes they would utter a loud cry, “pee-pee-pee-pee.” But invariably it was the low, sweet, “crooning” note I have mentioned. As a rule, they took little notice of our being near, except that they were a little shy and cautious in their approach. On the last day, however, when the young were ready to fly, they became very aggressive. The condition of

the precincts of the nest was anything but cleanly. The entrance rapidly became filthy after the young birds were hatched. Rejected food was allowed to lie until it became putrid and fly-blown. No attempt was made to clean things up. The nesting chamber, however, owing to the young birds' habits, was in a comparatively clean state. The birds themselves, both young and old, were in striking contrast to



SACRED KINGFISHER

Young bird, about 23 days old. It is just about to spring into the air for its first flight.

their surroundings, for they always preserved an appearance of having been "well groomed."

The rapid development of the nestlings during the last week in the nest was astonishing. As remarked above, they were hatched somewhere about December 20th to 22nd. Ten days later signs of fledgling were apparent. On January 5th one of the young was removed from the nest for the purpose of photographing it. At that time it was covered with "pin" feathers, and presented a very forlorn appearance. The bill

was only partially developed. It had neither strength nor ability to grasp a small branch for more than a few seconds at a time, and we had considerably difficulty in getting it to "pose."

By the following Wednesday evening a great transformation had taken place. The young birds were, by that time, fully fledged, and extremely vigorous. They clutched the small branch strongly, and made attempts to fly. It was evident that the time had almost arrived for them to make their "great adventure."

My final visit was made on January 12th. On examining the nest by the aid of the mirror, I found the birds still in possession. But they had changed so much during the last three days, that one could almost have mistaken them for mature birds. The plumage was full and "sleek," and, except for a small white patch on the top of the head, was identical with that of the old birds. The bill was now almost, if not quite, as fully developed as those of the parents.

When the light was thrown upon them, the young birds huddled together in the nesting chamber, with every evidence of fear. Meanwhile the parents, who had been hitherto very complaisant, assumed the offensive. They attacked with vigour, at the same time uttering loud, piercing cries. One of the young Kingfishers was removed from the nest and placed upon a branch. As soon as the hand was removed, he took flight, and was over the river almost before I had realised what was happening. I then turned to get No. 2, and was just in time to catch him as he came tumbling out of the nesting hole. At the same time I secured No. 3. No. 2 was placed on the branch. This one was even more lively than the first, for, giving a sudden kick, he released himself and joined his companion over the river in less time than it takes to tell. His progress was loudly acclaimed by the adult birds, who accompanied him in his flight. As I was most anxious to obtain a photograph, I determined to hold the remaining bird in my left hand while I released the shutter with the right. This plan was successful, for I obtained a very fine picture.

I had spent many interesting and profitable hours during the six weeks in which I had had these birds under observation, and it was not without a feeling of regret that I bade them good-bye. I have seen nothing of them since. It is said that Kingfishers return, year after year, to nest in the same locality. We hope, therefore, that it may be possible to renew the acquaintance next season.

[The illustrations are from photographs by Mr. Lang.—Ed.]

PLANT HUNTING ON THE UPPER MURRAY.

Report of an investigation by Mr. H. R. Williamson, F.L.S. of the Flora of the Upper Murray District, under the terms of a grant to the Club, made available through Senator R. D. Elliott.

During the fortnight ending November 17th, 1928, I visited the following places:—November 4th, Chiltern; 5th, Tallangatta (Granya Gap); 6th, Cravensville; 9th, Corryong (Mt. Mittamatite); 10th, Towong and Upper Biggara; 14th-16th, Shelley.

Chiltern.—On the Howlong Road, in a paddock, to which few grazing animals had access, I came across a wonderful display of bloom on the following plants:—Golden Everlasting, Small-leaf Parrot-pea, Hoary Sunray, Digger's Delight, Blue Pincushion, Pale Wedge-pea, Finger Flower, Austral Blue-bell, Grass Trigger-plant and Showy Guinea-flower. These were crowded thickly, and all showed a luxuriance and size of flower that I have rarely seen surpassed. I also came across a thicket of *Pultenaea styphelioides*, F.v.M., var. *mutica*, in full bloom. This plant differs from the normal, in having wider leaves, without pungent points.

Granya Gap.—By the side of the new road to Granya, about six miles from Tallangatta, I found, in October, 1925, a *Brachycome*, which I considered was an undescribed species; but, as with this genus it is absolutely necessary to obtain ripe achenes, none of which were then available, it could not be taken in hand. I was, however, on this occasion, able to get, about four miles out, good fruiting specimens, which confirmed my former opinion, since agreed with by Mr. P. F. Morris, of the National Herbarium. I have handed the specimens over to the Government Botanist, and I understand that Mr. Morris is to describe the plant. I was too early to obtain good flowering specimens of *Pimelia Trevoandii* (F.v.M.), Ewart, and the shrubs of *Grevillea polybractea*, H.B.W., which I had seen in 1925, had been completely burned off. The profuse blooms on large bushes of *Pultenaea Cunninghamii* (Bth.), F.v.M., and *P. polifolia*, A. Cunn., growing in the old bridle track made a fine show.

Cravensville.—I visited this place chiefly to try to collect the peculiar little Elbow Orchid, *Spiculaea Huntiana* (F.v.M.), Schlecht., specimens of which were gathered there by Mr. A. B. Braine in 1917.

Accompanied by Mr. Ivor Evans, who was the first to see the plant in Victoria, I searched the area for over two hours, but the fact that the plant cannot be seen, except at flowering time, and also that the flowering season may vary from year

to year, may explain our failure to find it. During the afternoon of the 6th, Mr. Evans and I gathered 16 species of orchids, and on the next day added eight more to our list. All were common to the Melbourne district, except the two species of *Chiloglottis*, *C. trapeziformis*, Fitz., and *C. Pescottiana*, Rogers. Both were in bloom, and growing intermingled in a few patches near the road up to the post office. The latter was described by Dr. Rogers from specimens sent to Mr. Pescott, F.L.S., after whom it is named. It was pleasing to hear on all sides the respectful and admiring references to my friend, Mr. Braine, and to find that the interest aroused by him in the numerous orchids of Cravensville is still sustained by his old pupils, several of whom I met.

The Eucalypts noted were *Euc. niminalis*, Lab., *E. ovato*, Lab.; *E. australiana*, Baker and Smith (very large specimens), and *E. dives*, Schauer. The last-named, Broad-leaf Peppermint, has lately been exploited there for distilling of oil, but operations had been for a time suspended.

Corryong, November 9th.—This town, nine miles from the railway terminus (Cudgewa), is the centre of a very fine grazing district, from which an immense quantity of cream is delivered to the local butter factory. The wide alluvial area along the creek was covered with a luxuriant growth of grasses, mainly Rye and Soft Brome, and clovers which provide fodder for many dairy cows and fattening bullocks. Making my way across this land, and crossing the creek at a bridge, I ascended Mount Mittamatite, and spent a day examining the vegetation. On rocky outcrops, half way up, *Bursaria* and *Varnish scacia*, neither in bloom, were met in abundance, with fine flowering bushes of *Pultenaea styphelioides*, A. Cunn. normal, and tall specimens of *Xanthorrhoea australis*, R. Br., up to 12 feet, were seen in flower, while *Isotoma axillaris*, Lindl., and *Stypandra glauca*, R. Br., were fairly common, the former with a few early flowers, and the latter nearly done flowering. Away from these rocks, *Brachylonus daphnoides*, Bth., and *Hibbertia linearis*, R. Br., were common, the large yellow flowers of the latter being the most conspicuous. Only two ferns besides the common Bracken were seen—the little *Cheilanthes* and the trailing *Asplenium*. Six orchids common near Melbourne were in flower. Along the summit, the flowering shrubs were in profusion, the finest show being made by Hop Bitter-pea, Purple Eyebright, and the Tall Daisy, the last-named, *Brachycome diversifolia*, Fisch and Meyer, occurring in line patches, ten yards across. Both the Cherry Ballart, *Exocarpus cupressiformis*, Labill., and the shrubby *E. stricta*, R. Br., with pale lilac succulent stalklets, were noted. *Euc. macrorrhyncha*, F.v.M.; *E. elucophora*, F.v.M.;

E. globulus, Labill., and *E. dives*, Schauer, were the only Eucalypts seen, the last two on the summit.

Biggara, November 10th. This settlement was reached by taking the Khancobin (N.S.W.) mail car, which crosses the Murray at Bringenbong Bridge, and boarding a horse-drawn vehicle a mile before reaching the bridge.

The driver of this trap calls at Upper Towong (Findlay's), and then proceeds up the river to Biggara, about 15 miles from Corryong. I obtained accommodation with a dairy farmer on Biggara Creek, and in the afternoon examined some lagoons on the thickly-grassed alluvial flat, through which winds the Murray River, just here hugging the hills on the New South Wales side. The lagoons were bordered densely with *Phragmites vulgaris* (Lam.), Druce, (*communis* Trin.) *Heliocharis sphacelata*, R. Br., and covered with *Myriophyllum elatinoides*, Gaud., and *Azolla filiculoides*, L., interspersed with the tiny *Wollsa arrhiza* (L.), Wimm., and two species of duckweed, *Spiradela oligorrhiza* (Kurz), Hegelm., and *S. polyrrhiza* (L.), Schleid, Large Duckweed. I was specially pleased to get this last-named plant, for the only record for Victoria is: "Rare in lagoons at Towong, F. Mueller, 1874."

Among the Duckweed were many floating fronds of a Liverwort, probably *Riccia nutans*, with light green upper surface, and black flaky root-like processes below. The next day I spent on Mt. Biggara. By this name I indicate the highest point of the range separating the Murray from the Thowgla valley, and lying west of the Biggara post office. A track from Corryong to "Tom Groggin" crosses this watershed from the Thowgla valley, and from this saddle I made my way up the long spur to the summit, from which I looked down at Thowgla, to the west, and across to the south-east obtained a delightful view of Mt. Kosciuszko, with its shining white covering and snow-streaked slopes.

The whole of the way (about two miles) the Crimson Grevillea, *G. polybractea*, H.B.W., was in abundance, in good flower above, but fruiting near the Gap. I was told that the district residents call the flower "Waratah." Seen at its best, it is certainly one of the most beautiful of our Grevilleas. As a wild-flower garden, the upper slope of this hill rivalled the little paddock at Chiltern, the scene comprising fine blooms of Pale Wedge-pea, Purple Eye-bright, Showy Guinea-flower, Silky Daisy-bush, Hop Bitter-pea, Hoary Sunray, Spoon Rice-flower, Grass Trigger-plant and Prickly Bush-pea. Six orchids, common near Melbourne, were noted, and the Eucalypts were those mentioned on Mittamatite, with the addition of *E. viminalis*.

Upper Biggara.—Riding three miles in a cream-cart, and walking three miles further up the river, I reached the ultima, as regard residential sites on the Murray, within perhaps ten miles of "Tom Groggin." I spent most of the time on the river bank and round the lagoons, examining aquatics, but was disappointed at not coming across such rarities as *Spargunium antipodum*, Gracba.; *Brasenia purpurea*, Casp.; *Viola Caleyana*, G. Don, and others, and I saw no more of the Large Duckweed. I saw three more snakes, one of which, a brown, I killed. I was told that up here tiger snakes are not seen.*

While specialising in reptiles, I picked up a river-tortoise, which was toddling along in front of me, its long neck stretched forward. I brought it home, and I suspect it is now hidden away in a corner of my garden. The shrubs on the river banks comprised mainly *Hymenanthera dentata*, R. Br.; *Leptospermum flavescens*, Sm. (Tantoon), and *Pomaderris apetala*, Lab., all about 15 feet in height, only the last-named in flower. Many places were impenetrable tangles of Thatch Reed, and various species of *Carex*—*C. appressa*, *pseudocyperus*, etc.—and *Cyperus*. Native nettles, *Urtica incisa*, Poir., were seen scrambling among these, and introduced thistles and Fog Grass filled up the gaps.

I was not prepared to find the river so wide here. There were stretches of it almost straight, and about 50 yards wide. Here and there it runs round a rocky point, and the road has been carved out of a hill, the stony material being thrown into the river to lessen the erosion that, in time, would make necessary the further excavation of the hill, if traffic up the river is to be maintained. In places the stream has divided into two, or even three, branches, and the islands so formed, with the bowers of the willows (planted to prevent erosion), the tea-tree and violet bush, make up some very picturesque vistas. I found myself contrasting these scenes with what I saw a few weeks before on the lower reaches of the river, 40 miles below Mildura, at Number 9 Lock, where one gets just the idea of vastness—a giant stream, bordered with giant trees.

Along the Biggara Creek, I met with a few bushes of *Pimelea pauciflora*, R. Br., a plant allied to *P. axiflora*, F.v.M., but having flower clusters terminal on axillary branchlets, and presenting a great diversity of leaf, from lanceolate, over

*I found that the warning that I had received about snakes was not unnecessary, for I saw one, and then, although wearing thick leggings, I took care not to tread on any of the reptiles.

an inch long, to oblong, about a quarter of an inch long: My search for female flowers was unsuccessful. On the banks of the same creek, near the main road, I was pleased to find bushes of *Pomadourris cinerea*, Bth., which had once been recorded for Victoria from specimens gathered at Mt. Imlay, near Twofold Bay, a place that Mueller mentions in the "Flora Australiensis" as being in our State. We have now a definite record from a Victorian locality. Driving down the river, I noticed a few isolated trees of White Sallee, *Euc. coriacea*, A. Cunn., in bloom, and it was hard to realise that they were gum trees, so conspicuous were they at the distance, with their masses of snow-white flowers. Examining one near the road, I found it swarming with bright green beetles, *Telephorus pulchellus*, Macf.

An hour's search at the Bringenbong Bridge resulted in finding the sedge, *Carex polyantha*, F.v.M., by no means a common one, and a single specimen of *Barbarea vulgaris*, R. Br., Winter Cress, a crucifer, with yellow flowers, reminding one of Rape. It is a plant rarely gathered, though it has been recorded from the south as well as the north-east. The substantial bridge here—the first one under which the Murray River flows, gives communication between Corryong and the New South Wales stations. Just below the bridge the river, which is here 75 yards in width, takes a sharp bend, and, to lessen erosion, which is likely to be rapid in the soft alluvial of the valley, willows, in three rows, and securely fenced against cattle, have been planted.

Shelley.—I arrived here on November 14th, and spent two days on the watershed of the Mitta Mitta and the Upper Murray Rivers. Shelley, 23 miles from Tallangatta, has the greatest altitude of any railway station in Victoria, being 2562 feet above sea level. This fact, as well as the information that I had received, that no fires had ravaged the district of late years, and that there was very little stock on the place, made me wish to explore the locality. Among the first plants noted was *Pimelea Treynaudii* (F.v.M.), Ewart, which I found at its best on the granite banks of a stream that takes its rise close to the railway station. This Rice-flower, which was described from a specimen collected at Cudgewa over 30 years ago, probably occurs on all the hills over 1000 feet in altitude in the north part of County Benambra. Another Rice-flower, *P. spathulata*, Lab., in full bloom, was scattered thickly over the hills, being very profuse in some of the cleared paddocks. *Eucalyptus globulus*, Blue Gum, *E. dives*, *E. australiana*, with a smaller proportion of *E. viminalis*, comprised the forest flora, and the presence of vast numbers

of young plants of the first two named confirmed the statement that I had obtained regarding fires in the district.

It is sad to contemplate how the natural growth of this young forest of valuable trees may yet be checked by the careless use of fire. I was informed that leaves of the Blue Gum 2 feet 10 inches in length had been seen here, but my search for very long leaves was unsuccessful. The place has also a reputation for beautiful "gum tips," and certainly I have never seen elsewhere young foliage of a brighter or more varied character. The general display of ordinary blooms was very fine, the chief contributors to this being Mountain Mirbelia, Hop Bitter-pea, Pink-eye and Showy Guinea-flower. Along the railway, near Koctong, in open paddocks, were to be seen thickets of the first named, reminding one of gorse-infested areas of the old mining towns. The creek has been the scene of tin-mining operations, which have spoiled the natural beauty of about a mile of its length, and sluicing is still being carried on in a small way by one man, within a mile of the station, the tin ore being sent to Tasmania for treatment.

Above the sluice, which is supplied by a channel leading from a dam in the creek, there are springs and morasses, in which I spent some time searching for rushes, sedges and other semi-aquatic plants. *Hakea microcarpa*, R. Br., with its very small fruits and flattened leaves, some even half an inch wide; *Epacris breviflora*, Stapf; *E. microphylla*, R. Br., and *Olearia floribunda*, a densely flowering species, were all in bloom in these wet places. From *Epacris heteronema*, Lab., of Mueller's Key, a plant which Stapf has shown to be confined to Tasmania, the two species, *E. brevifolia*, Stapf, and *E. bawhawiensis*, Stapf, have been separated, the former distinguished by its short corolla tube and style. It is common in the north-east. The source of the creek, only a few hundred yards from the railway station, is a large spring, thickly overgrown with sedges and ferns, the latter including a few specimens of King Fern, *Todea*. Some of the sedges and rushes were in too early a stage of growth for identification, but I have a few reserved for critical examination. Regarding aquatic plants generally, the investigation of these should be carried on around permanent lagoons and morasses later in the season, when well-developed fruit can be obtained.

The approximate mileage covered during the trip was:—Rail, 510; motor, 48; horse vehicle, 20; bicycle, 14; on foot, 40—total, 632 miles. A large quantity of the material collected has been handed over to the Government Botanist for use at the National Herbarium.

HANGING FERN BASKETS.

Most folks have baskets hanging in fernery or greenhouse, and have been accustomed to a medley of exotic ferns, but it may not have occurred to them to try certain of our native plants, that seem to lend themselves very naturally to such conditions. I am not attempting to assert that I have myself tried all, or even the great proportion of those here suggested, but by observation I conclude that they are worth the attempt of field naturalists to secure for Victorian flora "its place in the sun."

Many have already tried the Lycopodiales, such as our *Selaginellas* and *Lycopodiums* (Club-mosses and their allies). Nor will I suggest many Alpine gems that, though dwarf and cushiony in their native habitat, develop elongated stems in lowland conditions, as will be found in such plants as *Nertera*. These elongate stems are not at all displeasing if plants such as are found in fern gullies be used. *Cynoglossum latifolium* has round, seabrid leaves and pretty forget-me-not-like blue, tiny flowers; *Australina (pusilla) muelleri*, with soft, dark, lined foliage has nettle-like flowers; *Stellaria flaccida* has elongate stems, with starry white flowers, *Asperulas* and *Galium* have yellow or white flowers, and their fruits are very pretty, remaining long, after the flowering period.

Some members of our Club collected a small *Lobelia* on the Pyrate outing, to grow under the suggested conditions, and there are several *Lobelias* and *Pratias* that lend themselves to the hanging basket. I had a glorious flowering *Lobelia* for several weeks in one of my own baskets this year, and it never failed to give me pleasure, as it depended so gracefully. Another basket had *Veronica serpyllifolia*, and such *Veronicas* as *V. calycina*, *V. plebeja* and *V. notabilis* would gratify the grower. I would try *Prosera binata*, with its forked leaves and beautiful, large, white flowers. And why not *Haloragis*, *Myriophyllum* or *Calthifraga*?

Viola hederacea flowers freely, and gracefully falls away from the basket. *Isotoma* and several species of *Goodenia* would be found useful also. Opportunity might be taken to observe, at a nearer view, such interesting, dainty rushes as *Brisula*, *Centrolepis*, dwarf *Juncus*, such as *J. plebejus*, *Hypolaena* (*Ocelatrophus*), *Carex*, *Shoenus* (such as *S. apogon*), *Cyperus* (several dwarf forms), like *C. tenellus*, *Scirpus*. The grass-like wood-rush (*Luzula*) has several forms of heads, all pretty. Then there are dwarf plants such as *Claytonia*, *Mimulus*, *Mazus*, *Elatine*, *Sagina*, *Scutellaria*, *Mentha saturejoides*, *Crassula*, *Brunella* and *Lycopus*. *Libertia* (*Sisyrinchium*) *pulchella* is very graceful, with its umbrella-like heads of peculiar flowers.

There are many composites, lowly, and with small flowers, such as the smaller *Brachycomes*, the woolly *Stuartina Muelleri*, *Gnaphalium ciliatum*, with flannel-like leaves, *Rutidosis pumila*, *Mitella*, *Podotrocha angustifolia*, *Myriacophalus*, *Isotopsis*, and, perhaps, several others.

A. J. TADGELL.



GARDEN BRUSHTAILS.

One bright evening in January, I went in quest of possums in the Fitzroy Gardens. There was no sign of life until about 8 p.m., when a sudden rustling and whispering in the ivy-clad trees of the gully indicated that the Brushtails were awake. Soon a lady and a gentleman appeared, and proceeded to lay out small pieces of crisp toast on the railings. This was evidently expected, as almost immediately a mother possum, with a small joey on her back, came down and commenced to feed. So tame were they that they accepted food from our hands. Two others appeared, but kept at a respectful distance, not from shyness, however, as was shown when one of them ventured to secure an outlying scrap. Immediately the mother possum sprang at it, and both fell off the rail into the ground-ivy, whence emanated sounds suggestive of a subdued cat-fight. The joey, which had been roaming about, retreated up the tree, followed by the combatants, and No. 4 seized the opportunity to take a hurried meal. We watched until it was too dark to see. I was informed that the possums had been fed on several evenings during the previous fortnight.

A.E.R.

HABITS OF TRAP-DOOR SPIDERS.

A close observer of wild life, Mr. Walter Mitchell, of Ardlethan, N.S.W., contributes the following notes:—

Trap-door Spiders are rarely seen in the daytime. If you should happen to see one, it is only for a second, for, as soon as the spider hears a sound, it is off to its nest. It lifts the door, pops in and draws the door down again, all in a second. I have often watched them on a bright, moonlight night, chasing small beetles or other insects; when prey is captured, it is taken down into the burrow.

These spiders generally burrow in very hard soil, near green timber, from which they obtain a supply of insects. They can easily be distinguished at night by their very bright eyes, which resemble two little balls of fire. The burrow or nest, instead of going straight down, generally zig-zags for a few inches of the way. The door fits so perfectly that it is impossible to stick a pin between it and the wall, except by force. There are thousands of young Trap-door Spiders about this year. They make burrows for themselves; very small ones at first.

WORK ON CORAL REEFS.

When the expedition to Funafuti was organised by the Royal Society of London, under the leadership of Prof. W. J. Sollas, and, later, of Sir Edgeworth (then Professor) David, Professor Judd was given charge of all material of land, with a view to working out results. In the course of this investigation, Professor Judd gave to Mr. F. Chapman, A.L.S., the task of reporting on not only the fossil reef foraminifers brought up in the core, but the whole of the soundings, dredged by Admiral Wharton, among the coral islands of the neighbourhood, as well as in the lagoon itself, and from the boring in the lagoon.

At South Kensington, Mr. Chapman superintended the slicing of the cores and the preparation of microscope slides from the sand material. The foraminifera occurring in these thin sections, as seen under the microscope, were all enumerated by Mr. Chapman, and the results were embodied in Dr. Hinde's general and detailed reports. These were published in the magnificent volume, issued by the Royal Society of London. The slices of the cores were all photographed by Mr. Chapman, but the actual reproductions of these were never published. Mr. Chapman still has in hand the description of these unique slices and photographs, and a letter written to him by Professor Judd, in 1903, relating to the publication of these photographs, and their description, gave him a free hand as to the manner of their appearance. These, he hopes, shortly to finalise.

The results of Mr. Chapman's investigations on the soundings and borings of the Funafuti expedition were embodied by illustrated papers, published by the Linnean Society of London, between the years 1899 and 1902. Since then, the investigation of the reef-building foraminifera has been carried out in other coral regions.

THE ROTIFER *LACINULARIA RETICULATA*.

In the report, "Excursion to Botanic Gardens" (*Naturalist*, XLV., p. 220), appears, in reference to the rotifer *Lacinularia reticulata*, the following sentence: "Unlike most *Lacinularias*, which form large colonies, this species is found solitary." This statement may be taken to mean that the species is one in which the individuals occur only singly, whereas it mostly exists as clusters of many individuals, probably exceeding, in this respect, any other form. The original description (*Proc. Roy. Soc. Vict.*, IV., 192, p. 73), states that it is found in small colonies of two or three, the largest being a dozen individuals. In a further publication, "List of Victorian Rotifers," etc., by J. Shephard (*Proc. Roy. Soc. Vict.*, N.S., Pt. 1, 1911, p. 49), it is stated that this form has been found in large clusters upwards of one inch in diameter. It may be added that this striking species, so far, has not been recorded outside Australia, and its distribution is of interest. The individual rotifers do not merely exist adjacent to one another, but are contained in the gelatinous residue of the cluster. The explanation of the appearance of the species as a solitary animal is that when hatched from a resting egg, the animals settle themselves singly, but soon develop clusters. These remarks apply to the female, the male being a free-swimming animal. The large clusters came from Cheltenham Park.

J. SHEPHARD.

VICTORIAN CRUSTACEA.

The attention being paid to Victorian freshwater crustacea by visiting naturalists, notably Professor Nicholls, of the University of Perth, W.A., should stimulate our own interest in this section of our fauna. Mr. Searle has issued a challenge, in his note on *Koonunga cursor*—a challenge or an invitation. There is ample scope for original work.

Our marine crustaceans offer another field, though the chances of discovery may be fewer in the sea—the shallow region within easy range for collecting than in fresh waters; but opportunities for observing habits are greater in the case of marine forms, than among crustaceans of the lakes, ponds, and streams.

Two notable papers have been promised for the *Naturalist*. Professor Nicholls will contribute an article on freshwater crustacea and Mr. Melbourne Ward will deal with the crabs of Port Phillip Bay and Western Port. Mr. Ward has long been interested in marine invertebrates, crabs especially, and has collected and observed in many parts of Australia. The most of his early studies of crabs were made in Port Phillip. Lately, he has been working among coral reefs in North Queensland.

A special study of our Land Crayfishes is desirable. Little is known respecting their habits, though fairly extensive collections have been made. The Genus *Engaeus* is dealt with by G. W. Smith and Dr. E. H. J. Schuster, in a well-illustrated paper (*Proc. Zool. Soc., London*, 1913, Pt. I.), based largely upon material in the National Museum, Melbourne. But the notes on habits are scanty. The burrowing crayfish is sufficiently familiar; at least, its burrows, with the clay-pellet turrets, abound, even near Melbourne, but of the creature's ways of living we have much to learn.

Lately, at an elevation of 2,500 feet, near Healesville, I captured a specimen of *E. hemicirratus*, in a shallow burrow, beneath a stone. Its "pool" was not a foot in depth; yet often the land crayfish lives in a puddle, of its own making, five feet, or even more, underground. Small crustaceans often are associated with *Engaeus*; it has commensals; and a close search for these little messmates of the aggressive "land-crab" should reveal species new to science.

Miss S. M. Manton, of Cambridge, now in Australia, and H. G. Cannon, in a recent paper, read before the Royal Society of Edinburgh, discussed the feeding mechanism of the Syncarid Crustacea, including, of course, *Paranaspides* and *Anaspides*, of Tasmania, and our rare little *Koonunga*. The mouth parts of *Koonunga*, it was stated, show no evidence of a filtratory mechanism; this species being entirely a raptatory feeder. Miss Manton, I believe, will devote some time to studies of *Koonunga* in the field. She is joining the British Great Barrier Reef Expedition on Low Islands.

C. BARRETT

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THE FIELD NATURALISTS' CLUB OF VICTORIA.

The ordinary monthly meeting of the Club was held in the Royal Society's Hall on Monday, February 11, 1929. The president (Mr. F. E. Wilson, F.E.S.), occupied the chair, and there were about 80 members and visitors present.

CORRESPONDENCE.

From Council for Scientific and Industrial Research, advising that the Council had no administrative control over the poisoning of pasture lands.

REPORTS.

Reports of excursions were given as follows—Cape Woolamai, Messrs. V. Miller and L. L. Hodgson; Launching Place to Woort Yullock, Mr. H. B. Williamson, F.L.S.; Eltham, Mr. C. Borch.

ELECTION OF MEMBERS.

The following were duly elected on a show of hands:—As ordinary members: Mr. and Mrs. B. Blackburn, Armadale, and Mr. Arthur Pitcher, South Yarra.

GENERAL.

The President reported on the result of the deputation to the Minister for Forests in regard to the reservation of the Cumberland Valley as a National Memorial Park, and stated that the Minister was not prepared to increase the area beyond 640 acres. The President did not consider that there was any immediate danger of milling operations being carried on in the remainder of the Valley, but the deputation was, nevertheless, disappointed with the decision of the Minister. Mr. E. E. Percott suggested that a public meeting be arranged to protest against the action of the Minister in reserving only 640 acres.

The President welcomed to the meeting, Mr. Jas. Hill, of Murttoa. Mr. Hill spoke on the strange behaviour of some fly larvae and some ants which he had observed, and also gave his experiences of water-divining.

PAPERS, ETC.

Mr. A. N. Burns, F.E.S., read a paper on "Beetle Pests of the Sugar-Cane," in which he detailed the life histories of various beetles which attack the cane-fields in Queensland.

EXHIBITS.

By Mr. C. Daley, B.A., F.L.S.—(a) Forty-five species of plants from Mallacoota and Genoa River, including: *Fieldia australis*, an epiphyte on tree-ferns; *Rubus moluccanus*, Molucca bramble; *Persoonia linearis*, Geebung, in fruit; *P. juniperina*, *P. confertiflora*, *Gahnia melanocarpa*, Black-fruit Saw-edge, very rare; *Tetratheca ericifolia*, var. *glandulosa*; *Acacia subporosa*, *Xanthosia pilosa*, Woolly Xanthosia; *Loranthus vitellinus*, Long-flower mistletoe, only recorded in extreme East, found on *Angophora intermedia*, *Eucalyptus corymbosa*, and on the garden trees, Apricot and Plum; *Mela-leuca armillaris*, Bracelet Honey-myrtle; *Baeckea virgata*;

Trachymene Billardieri, *Helichrysum oblongifolium*, *Smilax australis*, Austral sarsaparilla; *Scaevola hispida*, *Opercularia aspera*, *Alyxia buxifolia*, Sea-box; *Eugenia Smithii*, showing unusual fasciation in twigs and leaves. (b) Chipped pebble stone axe and scrapers, from Mallacoota.

By Mr. F. Pitcher.—Cultivated plant of *Lindsaya linearis*, Swtz., Screw Fern, with fertile frond; plants in pot of *Blechnum penna-marina*, Poir, Alpine Fern, from Mt. Hotham, 3/1/29; herbarium specimens of same fern from Towonga, Kiewa Valley, and Mt. Hotham, 3/1/29; and fronds, over 5 feet in height, of *Blechnum capense*, Soft Water Fern, from Towonga, 3/1/29.

By Mr. F. E. Wilson, F.E.S.—Wasps, *Sceliphron laetus*, Smith, bred from the large mud nest exhibited at January meeting by Mr. H. P. McColl.

By Mr. V. H. Miller.—Aboriginal grinding stones and scrapers, from Cape Woolamai, 28/1/29.

By Mr. A. N. Burns, F.E.S.—(a) Cane and Allied Beetles from Queensland; (b) forms of *Hypolimnas bolina-nerina*, Fab., from Queensland. This species is very variable, especially the female sex. There are many intergrades between the marked forms exhibited.

By Mr. C. J. Gabriel.—Marine Shells—*Dolabella scapula*, Martyn (N.S.W.); *D. gigas*, Rang. (Mauritius), and *D. rumphii*, Cuvier (Mauritius). This genus belongs to the Family *Aplysiidae*. The shells are rudimentary, internal, contained in the mantle. The animals associate in considerable numbers, and prefer a bottom of sandy mud.

By Mr. A. L. Scott.—Striated pebbles, intrusive rock and granite in contact with bed-rock—all from Werribee Gorge.

By Mr. H. P. Dickens.—Photographs taken at "camp-out" at Cape Woolamai, 28/1/29.

ECHIDNA AS SWIMMER.

Anyone who has seen the Spiny Ant-eater, *Echidna hystrix*, dig itself in and vanish from sight in a few minutes, in solid earth, has no doubt about its digging powers; but, until recently, I was not aware that, on occasion, it will take to the water and swim readily. While fishing the Upper Yarra, near McVeigh's, in January, about mid-day, one of these animals was seen to enter the water without hesitation and strike out for the opposite bank, which it reached, despite the fact that it was borne down by the strong current over a rocky rapid into the boiling pool below. The Spiny Ant-eater is not often seen abroad during the day, but occasionally it fares forth, probably when pressed by hunger.

J.C.G.

PLANT HUNTING IN THE COBUNGRA DISTRICT.

Report of an investigation by Mr. H. B. Williamson, F.L.S., on the Flora of the Cobungra District, under the terms of a grant to the Club, made available by Senator R. D. Elliott.

On Saturday, December 1, last year, I arrived at the Cobungra Post Office, situated on the Bright to Omeo Road, about 15 miles from the latter place. I was met there by Mr. Henry Morgan, whose guest I was till the following Saturday, and who, with his brother, Mr. Tom Morgan, succeeded in making my visit both profitable and pleasant. It was a decided advantage to me that Mr. H. Morgan had obtained a good knowledge of the plants, and was able to point out the rarer ones. His discovery, in December, 1927, of a new *Caladenia* led to my making the trip, in order to procure fresh specimens. On the day that I arrived, Mr. Morgan lost no time in taking me to the locality of this orchid, which grows only about 200 yards from his home, and is reached by a stiff climb. I found it at its best, growing on the dry, rocky hillside, and was able to get perfect specimens. Some of these I sent to Mr. E. E. Pescott, who, after consultation with Mr. W. H. Nicholls, decided that it was a distinctly new species, and that the specific name should be chosen as a compliment to Mrs. R. D. Elliott. This beautiful orchid is now to be listed on the Census of Australian Plants as *Caladenia Hildae*, Pescott and Nicholls, Golden *Caladenia*, the type being in the National Herbarium. On the same hillside a fine patch of Sweet Forget-me-not, *Myosotis suaveolens*, Poir., was pointed out. This differs from the commoner *M. australis*, R. Br., in having stamens very much exserted.

The home of the Morgan Brothers is about half a mile from the junction of Spring Creek, which rises in Mount Phipps, 20 miles south west of Omeo; and the Victoria River, rising above Rundell's, on the Alpine Road. Owing to the absence of a bridge, and the rough state of the track, it is not possible to reach the house with a wheeled vehicle, so that supplies have to be carried on horseback.

On the Monday, provided with a horse, and accompanied by Mr. H. Morgan, I spent a couple of hours at Redbank, about eight miles up the Alpine Road, and examined some Sphagnum bogs in the valley of the Victoria, at an altitude of nearly 4000 feet. I regret that I forgot to borrow an anemoid for the trip. Here three species of *Epacris* were found in flower, *E. microphylla*, R. Br.; *E. bawbawensis*, Stapf, and *E. serpyllifolia*, R. Br., the last-named with smallest leaves, and not so well in bloom as the others. On the banks of the stream, which here winds through a well-grassed valley, a

couple of specimens of *Barbarea vulgaris*, R. Br., Winter Cress, the yellow crucifer mentioned in my notes on the Upper Murray, were gathered, and a few plants of Silver Aster, *Celmisia*, grew at the edge of the boggy ground. An attractive feature of the valley was the prevalence of Daisies, the genus *Brachycome* being represented by *B. scapiformis*, DC., and *B. decipiens*, Hk. f., both finer than I had before seen them; *B. scapigera*, DC., and *B. diversifolia*, F. and Meyer, were in drier ground, and in two spots patches of Alpine Daisy, *B. alpina*, P. F. Morris, previously recorded only from the Pretty Valley, Bogong Plateau, where I discovered the plant in January, 1923. One of the Burr Daisies, *Calotis scabrisifolia*, Sond. and F. v. M., with flowers of the colour and size of the Alpine Daisy, occurs freely on the hillsides hereabout. An early flower of *Richea Gunnii*, Hk. f., was collected, and just above the moss beds *Pultenaea fasciculata*, Bth., was coming into flower. Among the "Mat-plants" on the edges of the moss beds were *Veronica serpyllifolia*, L.; *Epilobium confertifolium*, Hk. f.; *Scirpus crassiusculus*, Bth., and *Stellaria multiflora*, Hk., the first-named sending up from its matted foliage leafy stems, with very small blue flowers. The last-named was more frequent on the drier pastures, where it was in an advanced stage. So impressed was I with the possibilities of the swampy flats below Mr. Morgan's Red-bank log hut, that I expressed a wish to revisit the place. This was readily granted by my host, and on the Thursday, accompanied by Mr. Tom Morgan, I made a search, which resulted in the finding of a rare Sedge, *Carex rara*, Boott (*C. capillacea*, Boott), hitherto recorded for Australia only from Clarence River, N.S.W. It appears to be widespread in Eastern Asia. Associated with this, *Carex stellulata*, Good., a sedge rare in the Alps, grew in great abundance.

Further up the river, where the valley was narrower, we passed over a large, mossy spring on the steep side of the valley, where *Richea*, *Epacris* (3) and sedges grew thickly. Later visits to this would, no doubt, reveal *Thelymitra nanosa*, R. Br., and other late-blooming plants. The most attractive part of the valley is where it takes more of the nature of a rocky gorge, and here the pretty, clear stream, in which many fine trout were seen darting about, was bordered with such ornamental shrubs as *Mirbalia*, *Bossiaea foliosa*, and the rarer Mountain Phebalium, *P. phyllifolium*, F. v. M., with its mass of light yellow blossoms. Another day was spent in the saddle, and the moss beds and their timbered surroundings on the Long Plain and the Round Plain were searched, the only

interesting plants collected being *Lycopodium clavatum*, L.; and a single specimen of *Caladenia alpina*, Rogers.

The rest of my time was spent in short walks, only once unaccompanied, within a range of three miles of home. The summit of Mount Parslow was reached by an easy ascent, and, although large trees on its crest had been felled, evidently to enable someone to obtain an extended view, yet the trees since grown up were tall enough to obscure the view of Mrs. Riggall's fine property, which lies a mile or two to the east of the hill. On the western slope of this I was shown an area where large quantities of manna had been gathered under the trees, and I naturally expected to find them to be Manna Gums, *E. viminalis*, but examination of the seedlings showed them to be Camillebarks, *E. rubida*, Deane and Maiden. In Maiden's "Critical Revision of the Eucalypts," I find the statement that in New South Wales manna is produced more abundantly from *E. rubida* than from *E. viminalis*.

One of the most common plants of the district is the Austral Anchor Plant, *Discaria australis*, Hk. f. It reaches a height usually of 3 feet, and has small white flowers, while its branches are reduced to stout spines, which easily account for its presence in an unutilized state in grazing paddocks.

On the banks of Spring Creek I came across a remarkable form of the same plant, shrubby, up to 10 feet, with a stem between two and three inches in diameter, showing above the tea-tree branches numerous, crowded leaves, and almost devoid of spines. Was this the original form, and the armed, almost leafless form developed as a necessity for protection of the smaller plant, growing on less congenial soil? Perhaps the smaller, armed form was the original, and, when conditions favoured a tall growth, it had the sense to spend more energy on breathing organs than on the now unnecessary defensive weapons. I have seen parallel cases in two other Australian plants, *Hymenanthera* and *Bursaria*.

A walk of about two miles up Spring Creek brought me to the place where, in January, 1922, I collected specimens of the Omeo Gum, the first seen since the species had been described as *E. neglecta*, Maiden, from a specimen sent by Howitt in 1882, and unnamed for 40 years. Dense growth is the remarkable feature of this Eucalypt, but I found that rabbits can run freely through it, contrary to a statement made by a local resident prior to my inspection of the groves on Spring Creek. The plant is not confined to the Omeo District, for Mr. W. Mitchell has sent it to me from Buffalo River.

While at this spot, I was handed a fruiting branch of *Hakea sericea*, Schrad., which, I was told, came from a tree about 20 feet in height, with a stem over 6 inches in diameter.

It was too far away for me to visit it to obtain a photograph. Here also I was pleased to find Mountain Crane's-bill, *Geranium sessiliflorum*, Cav., quite abundant. It is a stemless, tufty plant, with a thick, tuber-like rootstock, and its flowers, though a bright red, are difficult to see, so close to the root are they set.

It seemed strange to wander in the bush for a week and see no Braeken fern, but that was my experience, and Hop Bitter-pea, *Daviesia latifolia*, R. Br., usually so abundant on the north-eastern hills, I met with in small patches only. My first experience of the Ovens Everlasting, *Helichrysum Stirlingii*, F. v. M., was when I was introduced to a miserable shrub of it on a steep hillside. It cannot long survive, and Mr. Morgan tells me that he knows of only one other plant of it.

Tussock-grass, *Poa caespitosa*, G. Forst., in its varied forms, depending on situation, constitutes the main part of the herbage. On the higher land, where it is called Snow-grass, the tussocks are low and dense, and leaves soft and fine, while on the river flats it takes on a taller and coarser nature. Kangaroo-grass is not common, and I saw scarcely any Wallaby-grass, *Danthonia penicillata*, F. v. M. My rambles took me into no really valuable timber, though I was shown at a distance a patch of Silver-top, *E. Sieberiana*, F. v. M., called here "Woolly-but." White Sallee, *E. coriacea*, A. Cunn., known often as Snow-gum, yields most of the timber for fencing, etc. This and the Black Sallee, *E. stellulata*, Sieb., form the bulk of the forest, and all the river valleys have a border of the last-named tree. Three common plants of the family *Scutellariaceae* form large patches of scrub on the high slopes—Pale-fruit Ballart, *Ezocarpus stricta*, R. Br., growing to 8 feet, and bearing pale-bluish fruits (swollen fruit-stalks); Leafless Sourbush, *Omphacomeria acerba*, A. DC., a wicy-branched shrub, with intensely sour green fruit ("Rooshans," by a bushman I met), and Dwarf Sourbush, *Choretum lateriflorum*, R. Br., a low shrub, also with sour fruits. All three are almost leafless. Two straggling Peas, *Psoralea adscendens*, F. v. M., and *Glycine clandestina*, Weendl., were putting forth their pale-blue blossoms, the former not at its best, and the Bitter Cryptandra, *C. amara*, Sm., was noticed as quite a showy bush. The curved Rice-flower, *Pimelea curviflora*, R. Br., which is inconspicuous in the grass land of other districts, grows here into tidy shrubs, up to two feet in height. Of other plants collected, the most notable were Dagger Acacia, *A. siculiformis*, A. Cunn., a plant with narrow, hard, spiny phyllodes, somewhat resembling *A. diffusa*, Edwards; Austral Cord-rush, *Restio*

australis, R. Br.; Sickle Bush, *Juncus falcatus*, E. Meyer, all confined to the north-east. Small-fruit Hakea, *H. microcarpa*, R. Br., was very abundant, and often in good bloom. No sign of flattened leaves could be found, whereas at Shelley, in the Tallangatta District, this plant had the lower leaves flat, some being nearly half an inch broad. It is cursed by the scrub-cutters on account of its large, tough rootstock.

When revisiting the patch of Golden Caladenia, on the day of my departure, I was fortunate enough to collect an orchid, a small *Prasophyllum*, which Mr. W. H. Nicholls assures me is a species not yet described. I found only one specimen, though I spent a long time searching round the spot. I shall, of course, endeavour, during next flowering season, to obtain fresh specimens, so that it may be described. The only other orchids collected were Common Sun-orchid, Scented Sun-orchid, Common Spider-orchid, Tiger Orchid, and Snake Orchid, the last named being by far the most numerous.

A remarkable example of "Fairy Rings" was noticed when looking from the main road over the open, undulating grazing land of Mrs. Riggall's Cobungra property. Large rings could be seen on the slope, half a mile distant, which, I judged, would be more than 50 yards in diameter. So distinct were they, that I yielded to the temptation to expose a film on the scene, but I apparently miscalculated the efficiency of my lens and my ability as a film manipulator. On examining a small one near the road, I found nothing but a ring of dried vegetation, such as might be produced by using a trickle of plant poison from a can fixed at the end of a moving radius about ten yards long. I have read of similar rings, up to 200 yards in diameter, being seen on hillsides in England, produced by the fungus, *Marasmius oreades*, but I cannot say whether any research on the matter has been carried on in our State.

One cannot be long in a forest region such as this without hearing opinions expressed regarding what I may call the "management of fires" in forest areas which are leased for grazing cattle. The "management" seems to amount to this: Allow leaseholders to burn at their discretion (as they openly claim), in order to prevent serious outbreaks of fire, and to improve pastures, the aim being to obtain vast areas of well-grassed uplands, almost devoid of trees and scrub. The principal argument in favour of this concession is that the timber at present on the bulk of these areas—Snow Gum, Black Sallee, Candlebark and Peppermint (*E. dives*)—is not nearly of such commercial value as the products obtained by cattle-raising. As many of our people have been allowed to settle in them for stock-raising for the meat market; we are told

that it is useless to prevent them from making them more and more profitable and safe to run their stock on. The problem of the State management of the vast upland forests, stretching from the Buller to the Coliberas, is one that will take wise heads to solve—whether, as it seems to be now trending, these highlands in the future are to be a great asset to the State as a cattle-raising area, tending to make us independent as regards our meat supply, or whether we must forbid grazing, and reserve the whole as a timber-producing area? A compromise between the two may be possible, but this is where the difficulty seems to lie.

EXCURSION, LAUNCHING PLACE TO WOORI YALLOCK.

On January 19 a small party journeyed to Launching Place, and an examination was made of the scrub near the railway station. In a small creek, the Red-fruit Saw-sedge, and Slender Knot-weed were collected, and a fine flowering patch of Garden Mint, *Mentha viridis*, was noted, a plant that should be on our Naturalised List, as it is at least holding its own in many places in the State. Here, too, a nest-building possum was disturbed.

A walk along the railway brought us to lagoons, about half-way to Woori Yallock. We passed some railway excavations, nearly dry, in which grew masses of Bulrush, *Typha*, now decorated with the dense flower-spikes. The first lagoon was deep, and was bordered on one side with masses of rock thrown down from the railway cutting, from which a few golden carp were seen, darting about in the clear water.

Further along, a more promising pond was visited, the surface of which was covered with Red Azolla, *Azolla filiculoides*, among which Common Duckweed, *Lemna minor*, and Tiny Duckweed, *Wolffia arrhiza*, were scattered. Round the edge of this pond coarse Water-milfoil, *Myriophyllum elatinoide*, and River Buttercup, *Ranunculus rivularis*, with other semi-aquatics, too young to determine, grew in the soft mud. Sweep-nets were piled for aquatic life, and the material taken has been examined by Mr. Stickland, a member of the party, who, besides compiling a list of the numerous forms identified, makes the following report:—

Micro-flora.—Algae were represented by 30 or more species, *Conjugatae* being especially numerous. Of these, *Desmidiium schwarzii* Ag., *Cosmarium turgidum* Bréb., *Microsterias truncata* (Corda) Bréb., and the remarkable Fishbone Desmid, *Triptoceras*, deserve special mention. Micro-fauna.—This section also had many representatives, Protozoa furnishing seven species of *Rhizopoda*, three of *Heliozoa*, 10 of *Mastigophora*, and 10 of *Infusoria*, while of *Rotifera* 10 species were noted; and of *Gastrotricha* two species, a spineless form, *Ichthyidium*, being uncommon. Vermes were also represented, and *Diptera* by the larval form of *Tanyptus* probably.

Mrs. V. H. Miller has sent in a list of names of the birds observed, and says:—Birds to the number of 32 were listed, comprising 27 actually seen—23, if we include the two introduced species, Sparrows and Starlings—and three easily-recognised bird-calls were heard. The male Blue Wren and the Red-breasted Fire-tails, of which many were seen, were in particularly good plumage. The most notable record was the Bell-miner.

H. B. WILLIAMSON.

FUNGUS BEETLES.

Popular names bring associations, and the word "fungus" brings to mind the magical light that emanates from the phosphorescent yellow toadstools growing along the sides of roads in Sydney in damp weather. Other situations prolific in several species of this form of growth are the fallen logs

in the heavy rainfall forests of Queensland, New South Wales and Victoria. These are sometimes inhabited by small, but interesting, and often beautiful, beetles belonging to the family Erotylidae.



The accompanying illustration shows an insect which occurs at Tambourine Mountain, Q., specimens of which were also taken by Mr. F. E. Wilson in the Blackall Ranges, Q., and subsequently described and illus-

trated by him in the *Proc. Royal Soc. Vic.*, 1921. The orange-yellow markings on the shining black wing-covers vary in outline, being more extensive in the example here depicted than in the average case (fig. much enlarged).

Fifteen species were listed under three genera and two sub-families in Masters' Catalogue, and, of recent years, Mr. A. M. Lea and Mr. Wilson have made additions to the list of fungus beetles. This little group is considered, by some authorities, to be akin to that of lady-birds, while others, more rightly, I think, place them near the Nitidulidae.

When the weather becomes wet, the collector, on a day's outing, can often turn to searching for these insects, and his chances of a catch will not be diminished by the rain.—
C. DEANE.

ETHNOLOGICAL SECTION.

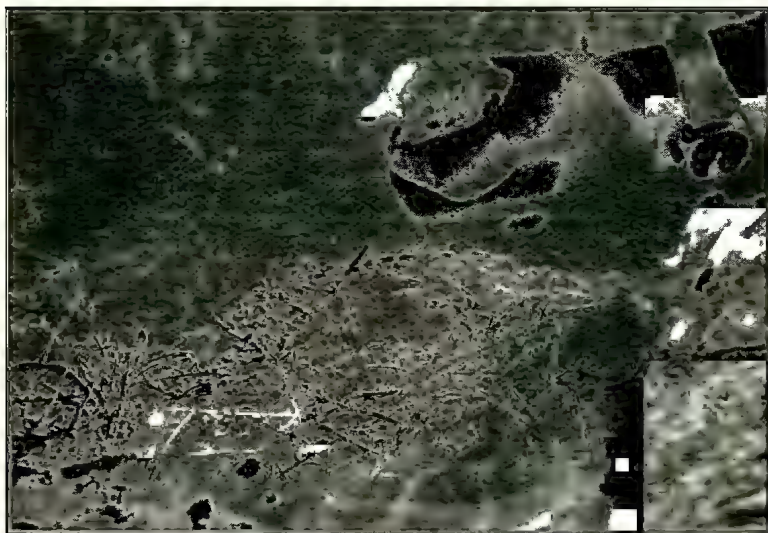
The monthly meeting of the Section was held at Latham House on Thursday, February 19, when Mr. A. S. Kenyon read a paper dealing with the divisions of the North American Indians and their culture. The paper was illustrated with a fine series of specimens, showing features of the Stone Age development—e.g., arrow-heads of several types, stone axes, the "pipe of peace," also clay jars and utensils, bead-work and basket-work, etc. The next meeting will be held on Tuesday, March 18, when a lecturette will be given and specimens exhibited. Members of F.N. Club and friends are cordially invited to attend.

THE FAT-TAILED POUCHED MOUSE.

BY DAVID FLEAY.

Our pouched mice are pretty, engaging little creatures, making most interesting pets, though their habits are nocturnal.

The slender-footed, fat-tailed species (*Sminthopsis crassicaudata*) is well distributed over the continent, spending the daylight hours in cosy nests beneath logs, boulders, or even heaps of cut gorze bushes. I had a pair of these tiny, soft-furred animals in captivity for four years, and another one, since liberated, occupied a self-made grass nest under a tobacco tin. In West Central Victoria, and on the Western District plains, these mice are by no means rare. The male is much larger than the female, and slightly larger than a house mouse.



Sminthopsis crassicaudata and its nest.
Photo by D. Fleay.

The general colour of this species is an ash or brown-grey, with lighter under-parts; a dark band usually extends from between the eyes to a point midway between the ears. The sharp-pointed nose, large dark eyes, prominent ears, and short, swollen tail, distinguish this animal at a glance from the troublesome *Mus musculus* of town and field. Roots are included in the bill of fare, but the dentition is a specialisation for the insectivorous diet.

On the plain country, I have dug these animals out of almost vertical burrows, with grass nests in an enlarged terminal chamber; but captive specimens have not attempted to burrow, though they constructed neat nests, under grass tussocks, in the cage. Ready-made homes, such as dry "yabbie" holes, are favoured, but in the winter season, especially after heavy rain, the small nests are found under old logs and rocks. Men on the land tell me that occasionally they plough these mice out of the ground. Though these useful insect-eaters are not extremely active, they very soon hide themselves under a clod of earth when disturbed.

My "fat-tails" were extremely fond of caterpillars, crickets, moths and grasshoppers. Tiny scraps of fresh meat, with bread and milk and honey, formed a very suitable diet, and the little animals did enjoy their meals. Strangely enough, my fat-tailed mice were on friendly terms with "Erastus," a pigmy flying phalanger, and the curious family slept in the same nest. "Erastus" had no relatives to keep him company, and was quite happy with his small, grey friends.

The most striking feature about the fat-tailed mouse is its short, thickened tail, so variable in character. In time of good health and plentiful food supply, this member is much swollen, resembling a miniature carrot, while at other periods it may be very thin. I have had many opportunities of watching such variations, and the tail must store a certain amount of fatty material, which is absorbed during a "lean" period.

The change of air from Ballarat to Melbourne brought about a great diminution in the caudal appendage of one of my mice. The reserve supply may be of use in the almost reptilian torpor brought about by the extreme cold of early winter mornings. When handled in this state, the little animals open their mouths widely, uttering feeble, hissing cries, resembling to a remarkable degree those of the dormouse phalanger in its dormant condition.

The usual cry of the animals seems to be a jerky, hissing note, and when wild specimens are handled, they scold vigorously in a similar voice, and give sharp bites. Owls must account for many of this species, considering that the animals are by no means so wary or quick in their movements as the introduced mouse.

The pouch is complete and well developed, containing ten mammae, though the greatest number of young I have known is nine. They are born in July or August and apparently crawl into the pouch, attaching themselves to the teats. Blind, naked, and almost small enough to need examination by a

hand lens, one finds it difficult to believe that there is life in them, but the little feet are certainly well developed.

Growing rapidly, compared with the larger marsupials, hair appears first on the head region, and later on the body. At the age of six or seven weeks the pouch is outgrown, and the young hang with heads in, and bodies out of the nursery. Possessing a covering of short fur, they little resemble the parents, with their short muzzles and stunted bodies. Very soon they hang to the sides of the mother's body when danger threatens, clinging with teeth and claws to her fur. Under the burden, she is very helpless, and moves away at a very slow pace, an easy prey to enemies. The mother mouse seems to leave her mate when nursing young ones, mainly, I should say, because he is a cannibal.

Normally, when hunting for food, with well-grown young to care for, the mother leaves them at home in the warm grass nest. She is indeed a faithful guardian to her offspring, and rarely fails to seek the whereabouts of a hissing youngster dislodged from its grip of her fur.

[Mr. Fleay, whose contributions to the *Argus* and other papers, under the pen name "Bookbook," are well known, is adding much to our knowledge of "familiar" animals, whose ways hitherto have been only casually noted. He is filling gaps in many marsupial biographies.—work of much interest and value.—Editor.]

THE SORRENTO BORE.

In 1910 a bore was put down at Sorrento, about six miles easterly from the entrance to Port Phillip Bay, by the Victorian Mines Department, under the direction of Mr. E. J. Dunn, F.G.S., the then Director of the Geological Survey. The object was to ascertain the thickness of the Tertiary formations, and to investigate their economic possibilities. The boring occupied about six months, and reached a depth of 1636 feet, but the examination of the cores, which were handed to Mr. F. Chapman, A.L.S., Palaeontologist to the National Museum, Melbourne, has been a much longer task. The results, as published in part I. of Volume V. of the "Records of the Geological Survey of Victoria," form a valuable contribution to the knowledge of the Victorian Tertiaries.

The report extends to nearly 200 pages, and exhibits the difficulties of the examination, and the subsequent summing up, very graphically. The core amounted to 113 pieces, each being submitted to critical examination, and its contents noted, recorded and listed. Thus, the core, at 990 feet, showed 60 species of fossils belonging to seven groups, while at 1215 feet 35 species were found, belonging to eight groups, each determination varying more or less, as to its contents. In this way the contents of the whole core, less the first 67 feet, which, being comparatively re-

cent, were not examined, is set out, and the species are fabulated in their natural sequence from Foraminifera to Fish remains.

A classified list of all the fossils found is compiled from the 113 examinations made, and the depths given at which each species occurred. This may be only once, or it may be 50 or 60 times. Naturally, a number of new species, amounting to about 60, was found. These are fully described and figured in 12 plates, appended to the report. Many of the figures are variously enlarged, and most of them are from drawings by Miss Winifred Chapman, the balance being by the author himself. The author's general remarks on the faunas found, and the stratigraphical horizons laid down, are most interesting, and relate many cases where either identical or closely-allied forms are still to be found living in more or less adjacent seas.

Mr. Chapman acknowledges the help received, in many ways, during his investigations, from Miss Irene Crespin, B.A., and Mr. R. A. Keble, Assistant Field Geologist, while Messrs. F. Cudmore, C. J. Gabriel and F. A. Singleton, M.A., gladly allowed comparisons to be made with specimens in their collections of both fossil and living specimens. The bibliography published should prove most useful to students of the groups of animals dealt with.

F.G.A.B.

THE CAPE WOOLAMAI EXCURSION.

A party of 23 members and friends (including 11 ladies) took part in the "Camp-out" at Cape Woolamai during the Foundation Day week-end, January 26 to 28.

Leaving Melbourne early on Saturday afternoon, the party, on arrival at Stony Point, found the launch "Hollydene" waiting to convey them to the Cape. A 'pleasant two hours' run round Tortoise Head, on French Island, past the hamlet of Rhyll and Churchill Island, and through the narrow channel between Newhaven, on Phillip Island, and San Remo, on the mainland, provided opportunities for observing large numbers of Black Swans, *Oenanthe atrata*; Pelicans, *Pelecanus conspicillatus*; White-necked Herons, *Notophox pacifica*; Silver Gulls, *Larus novaehollandiae*; Pacific Gulls, *Gabianus pacificus*; White-breasted Cormorants, *Phalacrocorax fuscescens*; Eastern Curlews, *Numenius cyanopus*; Sandpipers, *Tringa hypoleuca*, etc. The birds were especially numerous, on the mud flats near Rhyll and Newhaven, which are exposed at low tide. The Cape, which forms the extreme easterly point of Phillip Island, was reached at 7 o'clock. Camping sites were selected on the gently-sloping, sandy beach, backed by steep banks densely covered with tea-tree, affording excellent facilities for the purpose.

A few light showers during the night caused some slight discomfort, and everyone was astir early on Sunday morning. After breakfast small parties proceeded in various directions to investigate the surroundings—some to inspect the Mutton-bird rookeries, others to scratch over some old aboriginal kitchen middens, while a few tried their luck with rod and line, as a result of which several parrot-fish were landed. A number of stones, which had obviously been chipped and used as implements by the aborigines, together with some flint chippings and pieces of quartz, were collected. Blue-tongue Lizards frequented the camp, and were quite "tame," one being caught by a lady member of the party and fed from the hand.

Sunday evening was devoted to a visit to the Mutton-bird rookeries, on the high cliffs forming the south side of the Cape. We arrived at the rookeries about 7.20 p.m., and vast numbers of the birds (*Puffinus tenuirostris*) could be discerned, flying low over the ocean. After we had been watching for about half an hour, a few birds were seen to rise, this being the prelude to a general rising overhead. Within a few minutes there were tens of thousands of the birds; they wheeled and circled in every direction for fully half an hour—a beautiful and fascinating sight. As darkness became more pronounced, the birds began to alight and seek their burrows, affording us much closer views, with the aid of torch and lantern. A young bird had, earlier in the evening, been extracted from a burrow for inspection, and showed its resentment by regurgitating a quantity of an oily substance from its beak. On Monday morning, small parties again explored various parts of the locality, though nothing of outstanding interest was noted. One party, walking to the duck-swamp, near Newhaven, observed some Spur-wing Plovers, *Lobibyx novae-hollandiae*, in addition to various seashore birds.

The weather during the outing was very favourable, being cool and sunny, and bathing was enjoyed from a beach which was ideal for this purpose. The Cape was left at 4.30 p.m. on Monday, and after a pleasant trip by launch back to Stony Point, the party entrained for Melbourne. This excursion was in the nature of an experiment, as to the desirability of mixed camps, and was an unqualified success, thus amply demonstrating the practicability of "camp-outs" organised on similar lines.

V. H. MILLER.

L. L. HODGSON.

EXHIBITION OF ABORIGINAL ART.

Arrangements for the Exhibition of Aboriginal Art. to be held in Melbourne during July, 1929, are well advanced, and many exhibits of special interest have been promised, and lectures will be given by noted ethnologists. Copies of the famous Mootwingee rock-drawings and paintings will be shown, and probably a model of the Glen Isla rock-shelter in the Grampians.

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FIELD NATURALISTS' CLUB OF VICTORIA.

The ordinary monthly meeting of the club was held in the Royal Society's Hall on Monday, March 11, 1929. The President (Mr. F. E. Wilson, F.E.S.), occupied the chair, and there were about 100 members and visitors present.

HON. SECRETARY.

The President announced the resignation of Mr. L. L. Hodgson, on account of ill-health, and stated that Mr. A. E. Rodda had agreed to fill the position of Hon. Secretary until the end of the club's year.

CORRESPONDENCE.

From the Council of Scientific and Industrial Research, notifying vacancies for two junior entomologists, at £400 per annum, to work under the direction of Dr. R. J. Tillyard, Chief of the Division of Economic Entomology, to assist in the investigation of the buffalo-fly pest.

From the Dandenong Reserves Committee, announcing a deputation to the Minister for Forests, regarding the establishment of a National Arboretum at Mt. Dandenong, and asking for support for and representation by the club. Dr. C. S. Sutton was appointed representative of the club on the deputation.

From the Victorian and Queensland Railways, outlining forthcoming tours.

From Miss I. Stamp, of Brighton Girl Guides, asking that a lecturer be provided by the club to speak on nature subjects. (Mrs. Mattingley kindly offered to give an illustrated lecture on "Birds.")

REPORTS.

Reports of excursions were given as follow:—Botanic Gardens, Dr. J. A. Leach; Boronia, Mr. F. E. Wilson, F.E.S.; Black Rock, Miss J. Raff, M.Sc.

ELECTION OF MEMBERS.

The following were duly elected on a show of hands:—As ordinary members: Mr. E. Blakeman, St. Kilda; and Miss L. White, Canterbury.

GENERAL.

The President thanked Mr. V. H. Miller, on behalf of the club, for his generous donation of a copy of "The Spider Book," for the library.

At the invitation of the President, Mr. A. S. Kenyon gave a short account of a recent visit made by himself, Mr. C. Barrett and Mr. S. Mitchell to a cave in the Grampians, where interesting aboriginal drawings had been found.

LECTURE.

—Dr. J. A. Leach gave an interesting talk on the subject of "Swans, Ducks and Geese," which was illustrated by lantern slides and numerous bird skins, loaned from the National Museum. Several members joined in the subsequent discussion.

EXHIBITS.

By Mr. F. E. Wilson, F.E.S. Four species of Ant Lions:—*Glencoleon pulchellus* Ramb., *G. molecisus* Banks, *Callistoleon erythrocephalus* Leach, and *Acanthoecilisis funilata* Walk., the first two from Victoria and the others from Queensland.

By Mr. H. B. Williamson, F.L.S. (a) Flowers of "Murray Lily," *Crinum pedunculatum* R.Br., collected at Horse-shoe Lagoon, Mildura, by Mr. H. M. Finnigan. (b) Flowering plant of Coast Mistletoe, *Phrygilanthus celastroides* Eichl., growing on *Banksia integrifolia* L., collected at Paynesville by Mr. J. B. Thomson, and forwarded by Mr. T. S. Hart, of Bairnsdale.

By Mr. C. J. Gabriel. (a) Marine shell, *Cymatium spongeri* Chem., from Western Port, showing growth stages. (b) Egg capsules of the same, generally found in rocky pools at low water attached to rocks or broken shells.

By Mr. A. E. Rodda. Large nests of mud- and paper-wasps, from Chiltern.

By Mr. A. S. Kenyon. Stone implements from Mount Sturgeon, Wannon River, including choppers and planes of a very crude nature; also some hevallois flakes in microliths from the same place.

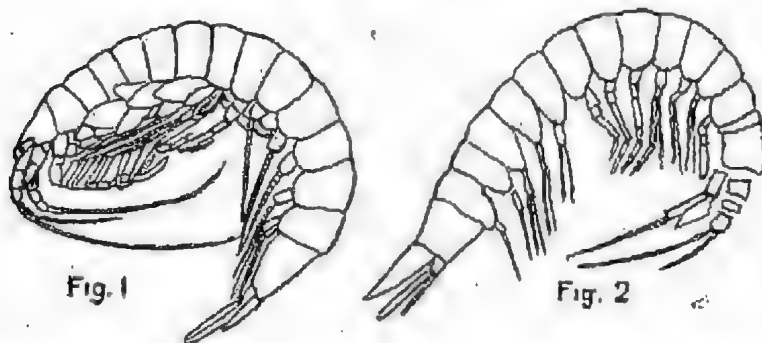
One of the most interesting *Voyages* is that of the French naturalist, Sonnerat, to New Guinea, published at Paris in 1776. Recently I purchased a fine copy of the book in Melbourne—the first I have met with during many years of book-hunting. Evidently it is a rare work. Its chief interest for Australian naturalists is in the fact that some of the birds figured occur in our country, chief among them being the Laughing Kookaburra, *Dacelo gigas*. A little problem has been presented to ornithologists by the inclusion of our familiar kingfisher in Sonnerat's collection. Probably the specimen he saw, in New Guinea, was one brought from Cape York by Malay trepang fishers, as suggested by W. B. Alexander in his article on the *Voyage a la Nouvelle Guinee* (*Emu*, xxiii. pp. 299-305). C.B.

NOTES ON FRESHWATER CRUSTACEA OF AUSTRALIA.

By G. E. NICHOLLS, D.Sc., A.R.C.Sc., F.L.S.

Australia has often been spoken of as "The Land of Living Fossils," the expression having reference to the fact that there persists upon this island continent a number of archaic forms of life which elsewhere have become extinct, but are known from fossil remains.

One particularly interesting example of this survival of an ancient group is the "Lung-fish" extant now only in one or two of the smaller rivers of Queensland, but first described from fossil remains, of great age, in Europe. Almost as ancient are some of our freshwater Crustacea, perhaps the best known of them being the mountain shrimp of Tasmania (*Anaspides tasmaniae*). This (Fig. 1) differs very little, so far as can be discovered, from fossil forms, such as *Palaeocaris* (Fig. 2), whose wonderfully perfect remains have been



disinterred from the carboniferous beds of North America and Europe. As in the case of the Lung-fish, these fossil species were familiar to scientists before the discovery was made that living members of the group (Syncarida) still existed in Australia.

The class Crustacea, of which the Syncarida forms a division, is of immense antiquity, fossil forms referable to it, or closely allied, being among the earliest forms of life which have left records in the rocks. As would be expected of so ancient a group, it has attained to a world-wide distribution, and exhibits a wonderful diversity of form, and, to-day, its members may be found in almost all the waters of the world, fresh and salt, from the great depths of the ocean to altitudes of 10,000 feet or more. Not content with

this, they have also invaded the land, where they occur plentifully in many localities, as land-crabs, pill-bugs and wood-hoppers, playing the part of universal scavengers.

Some forms, such as the brine-shrimp, have become remarkably adapted, thriving in strongly salt solution, and may be seen swimming languidly through a brine viscous almost as syrup. Forms such as these deposit their eggs in this evaporating brine, and with the complete drying up of the pool, the desiccated eggs are scattered as dust by the wind, presently to fall into water, there to hatch with amazing rapidity into delicate transparent larvæ, and repeat the life-cycle.

In view of their ability to withstand intense salinity, or, in the case of the ova, to survive desiccation—indeed, in some cases, to require desiccation—the present world-wide dispersal of such forms is little matter for wonder.

Of the freshwater forms, however, the present-day occurrence provides a problem of considerable interest. For many of these, a condition essential to life is the perennial supply of cool, well-oxygenated water. Thus, *Anaspides* has survived only, so far as our present knowledge goes, on, or near, the summits of three or four mountains in Tasmania, where a heavy rainfall assures perpetually flowing springs where deep crevices in the rock or large boulders afford shelter from the direct rays of the sun and refuge from possible enemies, where the altitude is sufficient to maintain water of a sufficient coolness, and where water weeds not only aid in oxygenation, but provide suitable spots for the deposition and attachment of the ova.

In such water-holes and runnels, on the tops of Mounts Wellington, Field and Read, and in some of the smaller tarns in the Hartz Mountains, these conditions have apparently persisted for immense periods, permitting the remarkable survivor from long-past Palæozoic times to continue almost unchanged. But, while in a few localities, an unaltered environment has allowed of such survival, over most of the world changing conditions have brought about the disappearance of these forms, or have permitted of their continuance only if they proved capable of adapting themselves to their gradually altering environment. Thus, on the Tasmanian Plateau, there existed, until recently, a related genus (*Peranaspides*), more shrimp-like in general appearance, and capable of maintaining itself under the far less constant conditions existing in the shallow and turbid waters of the Great Lake

Unhappily, the intervention of man, by the introduction into the lake of the trout (which has proved a very voracious enemy), as well as by the damming of the outlet, with the consequent great deepening of the water and the concomitant destruction of the weedy hiding and breeding places, seems to have brought about the practical extinction of this interesting form, *Paranaspides*.

Anaspides was described and named by the New Zealand naturalist, G. M. Thomson, in 1894, but it was to the insight of Dr. W. Calman, of the British Museum, that we owe the recognition, in 1906, of the fact that *Anaspides* was truly a member of Packhard's group—Syncarida—which, till then, was supposed to be represented only by forms long extinct. Barely three years later, Calman showed that yet a second living Syncarid had survived. This was an almost microscopic creature, named *Bathynella*, two specimens of which had come to light in the water from a deep well in Bohemia, as far back as 1880. Less than one-twentieth of an inch in length, its true relationships had remained wholly unsuspected.

Of recent years, other specimens of *Bathynella*, and of a related genus, *Parabathynella*, have been discovered in wells and caves of Europe, and in the Malay Peninsula. In certain respects, *Bathynella* has retained even more primitive features than *Anaspides*, but in other characters it shows marked modification of the Syncarid type; its reduced size, and the loss of eyes, and the reduction in the number of gills are all ascribable to its subterranean mode of life, extended over a vast period of time.

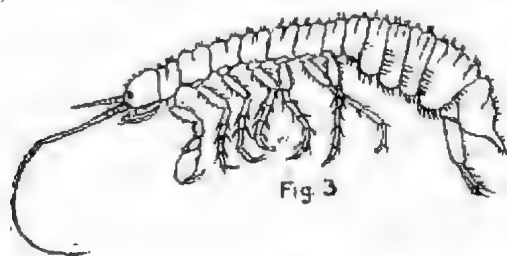
Now, the history of the Continent of Europe has apparently been a much more chequered one than that of the Tasmanian Highlands. Repeatedly, since Carboniferous times, large portions of Europe have been submerged, and, re-emerging, have experienced considerable changes of climate. It is thus that, only by the fortune of adaptation to a subterranean mode of life (with relatively constant conditions of moisture and temperature), members of this ancient group have persisted in the Northern Hemisphere.

On much of the Australian mainland, also, conditions have apparently been less stable. Temperature has probably varied over a much wider range, and the danger of desiccation has been correspondingly greater. It is of interest, therefore, to find that, while a representative (*Koonunga*) of this group has persisted in Southern Victoria, it is by way of becoming subterranean in its habits. Structurally, it has

travelled a long way from the Anaspidan type; its eye is reduced and without stalk, and a new sense organ has appeared, adaptations, doubtless, to life in the mud of creek beds. It has developed, also, a considerable resistance to changes in temperature, and while itself probably incapable of enduring dessication, its eggs would seem capable of development after a period of drought, during which they may perhaps be dispersed as wind-blown dust.

Yet another Syncarid has just been described, from the western coast of Tasmania, where it lives what is practically a burrowing life in boggy country, at comparatively low elevations. This species is completely eyeless, has fewer gills than *Koonunga*, and appears to form a link with the wholly subterranean Bathynellidæ.

Differing from the Syncarida in certain important structural features, as well as in the acquirement of the habit of nursing the young, is a second group, the Peracarida, two main divisions being recognised, viz., the Isopoda and the Amphipoda. In both of these the eggs are carried in a brood-pouch under the thorax until the embryos are sufficiently developed to fend for themselves. Of this group, as



of the Syncarida, Australia is the home of a number of interesting families. It may be said of the Isopoda, as a whole, that the body is depressed (flattened from above downwards), the common pill-bug or slater having very typically the Isopodan form, whereas the Amphipoda are generally characterized by a compressed body, well seen in the common "hoppers" of wood or sea-shore. In Australia, two peculiarly interesting fresh-water Isopodan families are known—the Phreatoicidæ and the Janiridæ.

Phreatoicus is found in Eastern Australian sub-alpine country, in the water of soaks or bogs, commonly under liverworts or spongy moss at altitudes varying from 2000 to 5000 feet. In Tasmania, several species occur in similar situations, as well as in open waters, but it is also found at

much lower levels in the muddy floor of water holes or creeks, in which the current is not too swift. In shape (Fig. 3), it is an exception to the rule among the Isopoda, resembling rather the Amphipoda, in having a quite strongly compressed body.

Recently there have come to light, in South and Western Australia, three other species of a related genus (*Amphispus*), all from more or less standing water in low-lying country, and in these the Amphipodan resemblances are even more strongly marked. Of greater interest is the existence of a number of species from subterranean water, of which one (*Hyperoedeipus*) occurs in West Australia, one in Victoria (*Phreatoicoides*), Fig. 4, and two in Tasmania (*Phreatoicoides* and *Hypsimetopus*), while in New Zealand three species of *Phreatoicus* are known, all being blind. Now, all of these subterranean forms have not only become eyeless, but they have elongated and are more nearly cylindrical in form, and bleached—a condition which suggests that this habituation to a subterranean mode of life has been a long-standing one. In 1914 came the discovery of the existence, upon the top of Table Mountain, of a South African species of *Phreatoicus*; while some three years later fossil specimens were obtained near Sydney, believed to be of Triassic age, of a species that differs very little from present-day forms. The fact that, in Tasmania, *Phreatoicus* occurs so frequently, associated with Syncarid forms, might suggest that the two groups were coeval, and that the Phreatoicid, possessing a greater adaptability, has survived over a much wider range. It is, however, quite possible that the Phreatoicidae are less ancient fresh-water forms, which have spread from the lowlands, coming, in course of time, to occupy, also, the sub-alpine waters, and, in Tasmania, to share these with the earlier Syncaridan forms. Even if this be the case, the association has been a very long-standing one, and both groups seem to have undergone a contemporaneous adaptation to a subterranean mode of life in Victoria and Western Tasmania. In Europe only the Syncaridan is at present known to persist.

The distribution of the Janiridae, too, is very similar. These are small Isopods, almost without exception, of marine habit—the very closely related Stenetridae being wholly marine, while the Asellidae, perhaps, as closely related, are entirely fresh-water forms, but are restricted apparently to the Northern Hemisphere. On the whole, the Asellidae retain a more generalised condition, and it is probable that

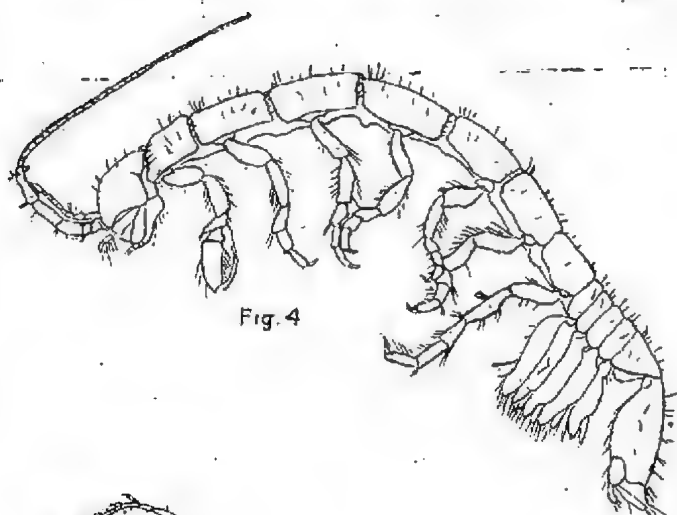


Fig. 4

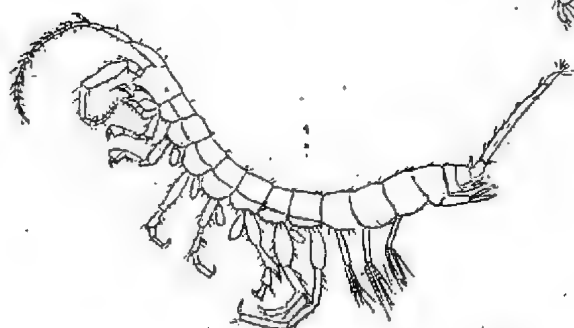


Fig. 6

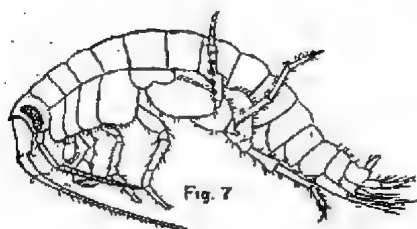


Fig. 7

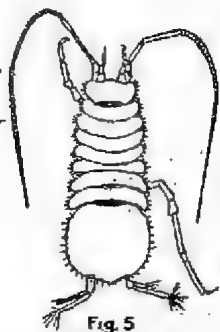


Fig. 5

the Janirids have had an Asellid ancestry, in which case they must, like the Phreatoicids, be of great antiquity.

It is therefore interesting to find that the Victorian species originally named *Janirilla pusilla* (Fig. 5), was found in association with *Phreatoicoides*, and may still be found in the haunts of *Koonunga*; a new Tasmanian species is abundant in company with *Phreatoicoides*, in Western Tasmania, and the third known species (*Protozanira*) occurs on Table Mountain, associated with *P. capensis*. These are all quite minute, rarely exceeding one-tenth of an inch in length, in every case colourless and blind, suggesting that they, too, are the survivors (thanks to an ability to accommodate themselves to an underground habitat) of the ancient Crustacean fauna once widespread in the Southern Hemisphere.

Of the remaining group, the Amphipoda, there is little fossil material. The present-day distribution of certain of the Australian forms suggests, however, that this, too, is an extremely-ancient group.

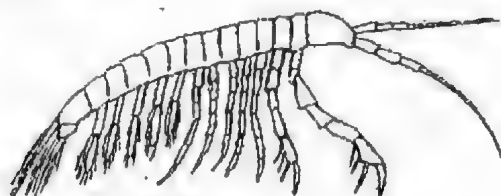


Fig. 8.

The Amphipoda constitute one of the largest of Crustacean orders, its members being characterized by a very general similarity of appearance; and they are almost invariably of small size. The recognition of species is thus a somewhat difficult matter, and classification often depends upon apparently trivial features. Upon land, in some cases, they are found in vast numbers, and may be seen actively jumping when a heap of seaweed is lifted, or a few handful of leaves are moved from the sides of a rotting log. These "sand-hoppers" or "wood-fleas" belong to an interesting and cosmopolitan family, the Talitridæ, of which the genus, *Talitrus*, with several Australian representatives, is perhaps of greatest interest.

One species, *T. locusta*, is extraordinarily abundant on all European coasts, extending now to the shores of the Red Sea; but other species have a much more restricted habitat, and now avoid the seashore, preferring forest country.

T. sylvaticus is said to occur throughout all the forests of Eastern Australia and Tasmania, but, in view of the altogether contradictory statements which have been made about it, there can be little doubt that, under this name two or more species, and probably two distinct genera (*Talitrus* and *Parorchestia*) have been confused.

In Western Australia, one, or perhaps two, species of *Talitrus* have been taken; South Africa harbours yet another, and is known from the Seychelles. The remaining species have turned up at times in botanical gardens (Kew, Paris, Brussels, and in the Scillies), where they have doubtless been introduced accidentally with exotic plants. There seems to be little doubt that, with the exception of *T. locusta*, the home of this genus is the Southern Hemisphere.

From New Zealand, the genus appears to be absent, its place being taken by *Parorchestia*, of which several species are found in the islands to the south. At the present time, *Parorchestia* is recorded elsewhere, only from the mountainous region of South Africa. The writer has, however, taken it abundantly in the wetter forest country of Western Australia and Tasmania, while Mr. J. Clark, of the National Museum, Melbourne, has quite recently collected a *Parorchestia* species from the Grampians of Victoria. It is undoubtedly distinct from *Talitrus*, but unless males are secured (and males of *Parorchestia* are often relatively scarce), it is practically impossible certainly to identify members of this genus.

While *Talitrus* haunts the drier region of the forest, and will drown if kept in water, *Parorchestia* must be looked for in damper localities, under wet moss, or beneath timber beside water, but both are terrestrial forms. There are, however, a number of Australian freshwater forms of very considerable interest—species of *Niphargus*, *Neoniphargus*, *Gammarus*, *Chiltonia*, etc.

Niphargus was, for close upon a century, known only as a rare creature from subterranean waters of Europe, where it has a distribution paralleling that of *Bathynella*. From Tasmania, two species were described by G. M. Thomson, but, quite properly, these were removed from *Niphargus* by Stebbing, who created for them a new genus, *Neoniphargus*, holding that they represented a modification of the *Niphargus* condition. But a year or two later, three specimens of an undoubted *Niphargus* (Fig. 6) did actually turn up, in Gippsland, being collected by Sayce, who found them associated with his *Janirilla* and *Phreatoicoides*. More recently,

the writer has found a similar association in Tasmania, a dozen or more specimens of *Niphargus* being found in company with a Janirid, *Phreatoicoides* sp., and also the blind Syncarid above mentioned.

A third Australian *Niphargus* has been taken (one specimen only) in New South Wales, so that there can be little doubt of a once widespread occurrence of this genus in Australia—and in every case it is a white, blind, subterranean form, very closely resembling the European species. In this lies its significance, for it has always been taken very sparingly, and almost certainly occurs at the surface only accidentally. While it might spread, in subterranean waters, over relatively wide areas, it could not possibly pass into countries separated by deep seas. From the nature of its habitat, it would be little likely to secure dispersal by means of water birds (as may, perhaps, happen in the case of surface-living forms), and, even if so carried, would be less likely to survive in competition with surface forms, or to secure transport to water which would offer it a subterranean retreat.

Thus, the present-day distribution of *Niphargus* is difficult of explanation, other than by the supposition of one-time continuity of existing continents.

The genus, *Neoniphargus* (Fig. 7), originally established to receive Thomson's species of *Niphargus*, is now known from many species. Sayce described two from Victoria, the writer a third (quite blind) species from Mt. Buffalo, as well as an eyed form, widely distributed in Western Australia, everywhere associated with the Phreatoicid, *Amphisopus*. Its main centre of development is, however, in Tasmania, where it shares the surface waters with *Phreaticus* and the Syncarids. In the latter country, too, several species show a tendency to become eyeless, while in Western Australia a derived genus, *Uroctena* (with several species), is wholly blind.

If Stebbing was correct in interpreting the structure of *Neoniphargus*, as indicating a close affinity to *Niphargus*, then, since it is scarcely conceivable that the blind form has given rise to the eyed, we must assume that *Neoniphargus* is the older, and that in it, as typically developed in the Tasmanian Lakes, we have a form that is probably coeval with *Phreaticus* and perhaps *Anaspides*. The wide development of blind Neoniphargid species suggests that the tendency exhibited long ago, which resulted in the production of *Niphargus*, is still active.

In South Africa and New Zealand, no representatives of *Neoniphargus* are recognized. On Table Mountain, an eyed Amphipod, known as *Gammarus nigriculus*, is found with *Phreatoicus*, and from adjacent localities no fewer than nine purblind species of *Gammarus* have been described in recent years, by Barnard, who has discussed the nature of these degenerate eyes and the cause which has presumably brought about the degeneracy.

In New Zealand, *Phreatoicus* is accompanied by a totally blind Amphipod, originally described as *Gammarus*. It is now recognised as distinct from that genus, and is named *Phreatogammarus*. Since the discovery of the New Zealand species, several Australian and Tasmanian species have been assigned to *Gammarus*, and it has even been suggested that *Neoniphargus* is really closely related to *Gammarus*, and that its apparent resemblance to *Niphargus* is merely an interesting example of convergent evolution. *Gammarus*, however, is typically a Northern Hemisphere form, attaining to a wonderful diversity in the region of Lake Baikal.

Moreover, the Australian species, attributed to *Gammarus* by Smith and Sayce, differ in certain important features from the Holarctic representatives. The former author, indeed, remarks that his species appear to be intermediate in character between the two genera. Barnard, too, in South Africa, finds considerable difficulty in interpreting the relationships of his species, and puts a number of questions, to which, at present, answers are not forthcoming.

From this quite incomplete summary of the known facts of distribution of these Australian Crustacea, it will be apparent that considerable interest attaches to the group, and that further study of them may help to provide an answer to the whole question of the origin of the Australian fauna. It is thus highly desirable that as much material as possible should be secured before the species become exterminated by the cultivation and drainage of the wetter regions in which they still survive.

The late Professor Harrison, in his presidential address to Section "D" of the Australasian Association, assembled a vast array of facts concerning animal distribution, which could most readily be explained on Wegener's Continental Displacement Hypothesis. Barnard, confining himself to the distribution of *Phreatoicus*, remarks that "the acceptance of the Wegener Hypothesis would be welcome." He continues: "The fossil *Phreatoicus* is exceedingly important, because it disposes of Smith's theory of a migration from the Northern

Hemisphere via the Andes and Antarctica, and shows that the tribe is both palaeogenic and austrogeic."

While, however, it may be true that the Andes were not in existence when an undoubted *Phreatoicus* was well established in Australia, it does not exclude the possibility of an earlier and much wider distribution of the Tribe Phreatoicidae. A well-preserved North American fossil, known as *Acanthotelson* (Fig. 8), much older than the fossil *Phreatoicus* from New South Wales, was quite possibly nearly related to the Phreatoicidae, and was contemporaneous with the fossil Syncarida.

The conclusion to which one seems forced is that all three groups (Syncarida, Isopoda and Amphipoda) are immensely ancient, and that the living forms, with well-developed eyes, still found on the Tasmanian Highlands, are probably the little-modified survivors of a Crustacean fresh-water fauna, once world-wide in distribution—a distribution only possible if there once existed a continuous land mass such as that suggested by Wegener.

[Material from Victoria and other States is needed by Professor Nicholls, in connection with his researches into the freshwater Crustacea of Australia. Members of the Club who may have opportunities for collecting specimens, are asked to do so, and to preserve them in spirits (not formalin). for the author of this valuable paper.—Editor.]

EXPLANATION OF FIGURES.

- Fig. 1.—*Anaspides tasmanica*, Thomson (after Chappuis).
- Fig. 2.—*Palaeocaris precursor* (Woodward).
- Fig. 3.—*Phreatoicus tasmanicus*, Thomson (after Smith).
- Fig. 4.—*Phreatoicoides gracilis* (Sayce).
- Fig. 5.—*Heteris pusilla* (Sayce).
- Fig. 6.—*Niphargus puchellus* (Sayce).
- Fig. 7.—*Neoniphargus yuli* (Smith).
- Fig. 8.—*Acanthotelson stimpsoni* (Packard).

AUSTRALIA IN AMERICA.

Several distinguished American visitors, on returning to their own country, have given lectures on Australia, making special reference to the fauna and flora. Dr. S. E. Longwell, of Middlebury College, Vermont, who spent some time in Victoria, visited Millgrove and other localities in the mountains. In company with some members of our Club.

In an illustrated public lecture, "Australia," delivered at the Middlebury Town Hall, Dr. Longwell showed many lantern slides, and had Australian tropical insects mounted flat against cotton, which, with a projection apparatus, were thrown upon the screen, much enlarged, in all the brilliance of their natural colors. Keen interest was displayed by the College students and Faculty. More than one expressed a desire to visit Australia.

Dr Longwell was delighted with his own wanderings in the bush, and being a keen observer of wild nature's ways, as well as a scientific biologist, he profited by all his excursions. He is passing on the knowledge gained to his students and others.

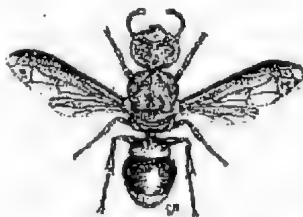
WASP STUDIES AT HOME.

By C. DEANE.

Light, misty rain, like spray, falls steadily around the sprinkler, making the flowers and grass sparkle in the sunshine. The scene is the home garden. An insect darts about in the bespangled air for a few seconds, makes a dive for a small pellet of moist clay among the foliage, and then flies off swiftly. A corner at the top of a verandah post has been selected by the wasp as a site for her nursery. Day long she flies to and fro, carrying pieces of building material, until a finger-shaped cell is built. When the eggs have been deposited inside, the entrance is closed with more clay.

On December 15, 1928, the work was started, and, day after day, with some exceptions, continued until, by January 1, the seven cells shown in the figure were complete. After another five days, seeing no further appearances of the wasp, *Paralastor* sp. (identified by Mr. H. Hacker), I enclosed the group of cells in a fly-wire cage; it was nailed around them on January 6.

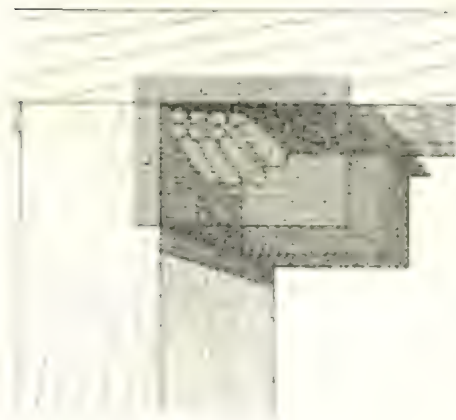
The site was, for me, a fortunate one, being near the back door, where operations could be watched with ease. How long would vigilance be needed? After a few days, a spider also took a fancy to the corner, and built some webs, but, when, on January 14, the first wasp emerged, spider and webs disappeared! The first cell had thus been opened.



On the 16th, another wasp emerged, and the second cell had been opened. On the 18th, a third wasp appeared, but no new cell was open. Two days later, the fourth wasp emerged, and the third cell had been opened. On the 23rd, the fifth wasp appeared, but still, only three cells were open.

At this time, ants visited the establishment, attacking one of the cells. They seemed to carry off debris, which looked like pieces of pupa case. The ants soon went away, not to return. On the 25th, the sixth wasp emerged, but no new cell was opened. On February 6, the seventh wasp emerged from the fifth cell, and on the 10th, the eighth wasp, from the sixth cell.

The first, second and fourth wasps are of equal, or nearly equal, size. The third wasp is larger, and the fifth, sixth, seventh and eighth are much larger.



Soon after its emergence, each wasp was withdrawn from the cage, apparently quite matured, but rather sluggish in movement, and placed in the killing bottle, subsequently to be mounted and labelled. A drawing of one of these insects is given. In the specimen chosen for the figure, the mandibles are concealed from above, even

though the head has been raised in setting. In all the other specimens, the mandibles are prominent.

All the cells have been opened, but I have not accounted for the opening of the fourth; this I am unable to do, and thus a gap in my records is manifest. The first wasp to emerge is smaller than the second. This explains the reason for the thickening of the cell behind.

NOTE ON *HYLAEUS NUBILUS*.

As the habits of some of our native bees are not well-known, the emergence of some 20 to 25 specimens of *Hylaeus nubilus* from the nest (five or six "cells") of a mud-wasp should be of sufficient interest to record.

Hylaeus nubilus belongs to the family *Hylacidae*, the members of which have smooth, shining bodies devoid of the thick covering of hairs so typical of higher bees; the mouth parts also are primitive, being comparatively short, and a further characteristic is that its members generally make use of some already-made cover in which to live.

The mud nest (collected at Hawthorn, towards the end of January, by Mr. H. McCloskey, who kindly handed it to me), was placed in a large glass jar against a window, and adult bees of both sexes of *H. nubilus* were seen emerging on February 3, and at intervals during the succeeding three or four days.

This species has a shining black body measuring up to five-sixteenths of an inch in length, the female being the larger, and is marked with yellow in patches on the thorax and face. On taking these specimens to the National Museum for identification, my attention was drawn to the fact that there is a considerable amount of variation in the finer details of colour pattern of this species.

JANET W. RAFF.

OBSERVATIONS ON THE HABITS OF SOME
TASMANIAN CRUSTACEA.

By SIDNIE M. MANTON, M.A., F.L.S., Ph.D.

In the past, the study of the external form of the higher Crustacea has been carried out mainly from a systematic standpoint, with a view to establishing the inter-relationships of the numerous forms. During recent years, attention has been focussed on the way in which the animals live and the manner of use of their complicated limbs. It is only when function is co-related with form that we can begin to understand the animal as a whole. This point of view opens up another method of tackling the question of the derivation of one type of animal from another, and elucidating the course of evolution within a group from living forms of the present day.

Among its interesting fauna, Tasmania is rich in possessing two species of "shrimp," *Paranaspides* and *Anaspides*, which are confined to the island. They are survivors of a group of Crustacea now extinct, except for *Koonunga* found spasmodically near Melbourne, and a few other minute forms. This group equals in rank the Decapoda, which comprises the numerous living crabs, lobsters, prawns and "shrimps." *Anaspides* and *Paranaspides*, moreover, have existed in this region for countless millions of years, probably since Permian-carboniferous times, and have little changed during that space. Thus, these shrimps appear at the present day almost as living fossils, and an examination of their modes of life and movements of limbs presents an interesting field for comparison with the more modern Crustacea.

A comparative study of the feeding mechanisms of the higher Crustacea indicates that the ancestral forms were, in all probability, filter-feeders, a stream of water being drawn forward along the mid-ventral line and passing out sideways between the maxillule and maxilla. Particles in suspension would be deposited on a filtering plate of setae, borne on the base of the maxilla, and would then be brushed forwards to the mouth by the combined action of the first trunk limb and the maxillule. In the more specialised modern forms, a rotatory action of the trunk limb exopodites aids in the production of the food stream, and in the most specialised types filter-feeding has been abandoned.

An examination of *Paranaspides*, a free-swimming form, confined to the weedy parts of the Great Lakes, shows it to

be a perfect filter-feeder in the manner indicated above, the mouth parts being used as in a filter-feeding mysid. The trunk exopodites beat in an oar-like manner, a type of motion to be expected in a primitive form, but so far not exhibited by any other Malacostracan which has been examined. The shrimp, however, is specialised, in that it is well suited to scrape up algal slime off the weeds with its mouth parts, and it also has an auxiliary food stream from the thorax, created in a unique manner.

Anaspides, found in many Tasmanian mountain streams and tarns, shows a further step towards specialisation. It is more bottom-crawling in its habits, and does not filter the water in which it swims, although its mouth parts closely resemble those of *Paranaspides*. However, it uses part of its filtratory apparatus to collect small particles of algal and diatom growth, which it scrapes off the weeds and stones without letting such particles be swept away by the flowing water. It subsidises this diet, when possible, by feeding on large food, such as worms and tadpoles, portions of its mouth parts being well adapted for this purpose.

Finally, *Koonunga*, the most specialised of the three, has given up filter-feeding entirely, as have the more specialised Malacostraca of other groups.

Anaspides is now abundant in some of the mountain streams, attaining a length of $1\frac{1}{2}$ inches. It can be very active, but it is not at all well able to withstand competition with other forms. A small caddis worm, one-quarter the size, can kill an *Anaspides* by a single bite. The now limited locality in which the shrimp is found may be due to the lack of competition in the mountain streams where *Anaspides* reigns supreme.

Paranaspides used to be abundant in the Great Lake, but during the last few years has been unobtainable. Its partial disappearance is, doubtless, co-related with the raising of the water level by the dam, an increase of 22 feet being realised during the past eight years. The weeds on the old Lake bottom were largely killed, and with them disappeared *Paranaspides*. Growth of new weeds in the new shallow water is a comparatively slow process, so that, in many parts of the Lake, weeds were temporarily absent. The "shrimp," however, has been found this year in certain places at the north end, where weeds cover old bottom, originally two feet deep.

The presence of *Paranaspides* in the Lake is of some economic importance, since this form and *Phreaticus*, another Crustacean limited to this part of the world, have

been largely responsible for the wonderful growth of the Lake trout. At present, *Phreatoicus* alone has been able to accommodate itself to changed conditions. It can be found abundantly near the new shores, and is largely maintaining the trout in food in certain places. It is a bottom-liver, favoring stony places; feeding much as an earthworm does. *Paranaspides*, on the other hand, is dependent upon the weeds, probably for suitable food and shelter from predaceous enemies, and also for laying its eggs. As the weeds become re-established in the Lake, it is to be hoped that *Paranaspides* will spread and become re-established throughout.

Other lakes in Tasmania are notably poor in invertebrates, and the trout in such lakes are underfed. A suggestion has been made to attempt the transference of *Phreatoicus* to these waters, in order to increase the food for the trout. *Phreatoicus* has been far more resistant to changed conditions in the Great Lake than has *Paranaspides*, and possibly could be introduced successfully to other lakes.

WHITE-FLOWERING BORONIAS.

The usual colour of *Boronia pinnata*, Pinnate Boronia, growing in the Grampian Mountains is pink; but recently I found near Mt. William a plant bearing pure white flowers. It is generally accepted as a fact that the earliest petals of flowers were yellow, and that, originally, all flowers were of that colour; the order of development of colour in flowers appears to be yellow, pink, red, purple, lilac, up to deep blue, while white may occur in any normally-coloured flower, hence white flowers in our Boronias may be called sports or albinos.

A blue-flowering Boronia, *B. caerulea*, occurs in the Grampians, and has also been observed to bear occasional white flowers. Brightly-coloured flowers frequently revert to yellow, as, for instance, *Gompholobium Huegelii*, a yellow, being the colour of the originally described species. The petals of the Brown Boronia, *B. megastigma*—one of the most popular—are dark purple outside, drying almost black, and yellowish inside. It is endemic to Western Australia, and is very largely cultivated for sale; it is the only Boronia suitable for perfumery purposes. A bright yellow-flowering sport is recorded from Albany, W.A.

One of the prettiest Boronias is *B. serrulata*, a native of New South Wales, and there called "Native Rose"—the popular name evidently alludes to the close clusters of pink flowers which grow on the end of each branch, and have a strong, aromatic scent. The name is, of course, inapplicable, but too widespread for correction. Some 80 distinct species of Boronia are found in Australia, and about half the number are endemic to Western Australia.

J. W. AUDAS.

REARING STONE-FLIES.

Australia has unique forms of Plecoptera, and the life histories of many have not yet been worked out. Rearing Stone-flies may present difficulties, but patience, allied to a little knowledge of the insects' habits, often brings success.

In a recent letter, Mr. Y. T. Chu, M.S., of the Department of Biology, St. John's University, Shanghai, China, gave me guidance in regard to the rearing of Stone-flies. He is a specialist in the taxonomy of Plecoptera, but none the less interested in physiological and ecological studies of these fascinating aquatic creatures.

"Last year, when I was in Hangchow," Mr. Chu writes, "I had the opportunity to make a study of our own Stone-flies in this province. . . The nymphs of Stone-flies are wonderfully adapted to live in the running water, as exhibited by their flattened bodies, which enable them to cling closely against the surface of the stone, or to hide themselves in the crevices of pebbles without being washed off.

"When pieces of small stones are quickly taken out of the water, some nymphs may be seen attached to the underside; they may remain motionless to escape notice, or else they will run all over the surface of the stone and suddenly drop themselves off down to the water. When they are collected in a small pan covered with some water, it is often observed that the larger ones may fiercely lay hold of the smaller ones by means of their maxillae, or they may climb up to the sides of the pan with a hope to get out. When kept for a longer time in the pan, they will stand up with their legs and move the body up and down to set the water in motion for better aeration. It is interesting to note in this connection, that they would die quickly if kept in a container with too much water, whereas if they are kept in a shallow layer of water in an open pan, they can live far longer.

"Another very interesting point is the correlation of the structure of the mouth parts to their food habits. These which are predaceous have their maxillae provided with pointed and recurved teeth, fitted for grasping and biting, whereas those which are herbivorous have the maxillae more or less blunt and the hinder portion of the mandibles provided with a wide chewing area.

"I reared quite a number of Stone-flies, from nymphs to adults, in wire cages, and fed the carnivorous forms with May fly nymphs and midge larvae, and vegetarians with decaying leaves. When the nymph emerges, the cast skin is a perfect specimen for the study of external anatomy. Thus, by rearing both the nymph and the adult, a species can be studied, and the specific characters for each form can be ascertained."

Mr. Chu spent more than a month in following the development of a species of Hangchow Stone-fly, and found it one of the most interesting pieces of work he had ever done. The eggs took almost a month to hatch out, and each infant insect crawled out from the egg-shell through a lid at one end, and began to fend for itself.

C. BARRETT.

LIFE HISTORY OF THE ANT-LION MYRMALEON. INOPINUS WALK.

By JAMES W. RAFF, M.Sc.

The following notes have been made from observations on an ant-lion larva, kept in a breeding-jar at the Zoology School, Melbourne University. It was one of two specimens handed to me on October, 1928, by Miss Jean Gardner, of Malvern, Victoria. She had just then received them from Tara, Queensland, and one of them was exhibited that evening at a meeting of our Club.

The larva measured about half an inch in length, and was placed in a glass jar 4in. x 3in. x 3in., with a quarter of an inch depth of sand, and this was kept on a shelf against a northerly window.

When brought to the surface of the sand, the larva would quickly disappear, always working backwards, and burrowing out of sight by rapid up and down movements of the tip of the abdomen. From time to time a small pit was made, measuring about one inch across, and frequently I would destroy this by shaking down the sand, and so levelling the surface, in the hope that the next one would be formed under observation, but, unfortunately, pit-making in every case was carried out over night.

Feeding time was (for onlookers at any rate) an event of the day, so to speak. I supplied several ants every two or three days, and these were grabbed at with remarkable rapidity by the larva, lying in wait at the bottom of the pit, sand being at times pitched up from the bottom to assist in the capture. At other times the prey was caught very easily, owing to its having become buried in a "land-slide" produced by itself on falling into the pit. Remains of ants that had been sucked dry were thrown out with remarkable force by the larva shovelling it on to its head with the help of its front legs, and then pitching it out by a sudden jerk of the head.

Towards the end of November, the larva ceased making pits, and on December 6 a small globular cocoon was found adhering to the glass bottom of the breeding-jar, with the half-inch depth of sand above it. The cocoon measured three-eighths of an inch in diameter, and was composed of fine grains of sand compacted together.

On February 7 an adult emerged. It was identified at the National Museum as *Myrmaleon inopinus*. It measured three-quarters of an inch long and has a wing span of one and three-quarter inches. The wings are quite clear, lacking the darker patches so often present in ant-lions.

It will be seen that the pupal stage in the above life-history lasted two months, but, no doubt, in its natural, warmer surroundings, this stage would have been much shorter. It should be mentioned that, during my holidays, I took the breeding-jar containing the cocoon to Lorne, where, for the last three weeks of January, the weather was decidedly cool.

NORTH AMERICAN MOUND-BUILDERS.

Numerous were the advocates of the belief that the Mound-builders of North America were a prior race to the Red Indians. The last blow was dealt to that theory in the excavation of a mound, one of the Fisher group, Joliet, Illinois, filled from top to bottom with the skeletons of buried Indians, each provided with funeral gifts of *European manufacture*. The finds include brass pots, scissors, knives, with French trade mark silver spoons, buttons, pins, etc., including a combination pocket compass and sundial.

A.S.K.